Electrical Review

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Electrical Review

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REMOVAL NOTICE.

The next number of the ELECTRICAL REVIEW, that of September 12, will be issued from our new offices in the Park Row Building, 13 to 21 Park Row, New York. The constant growth of the electrical field and the consequent increase in all the departments of the ELECTRICAL REVIEW have made larger editorial and business offices necessary. A commodious suite, occupying most of the front of the tenth floor of the Park Row Building, has been secured, and it is expected that we will occupy it about September 10. With an increased staff and an enlargement of the size of the weekly issue, we shall endeavor to make the ELECTRICAL REVIEW in the future even more than formerly an exponent of progress in the industry and of advance in the science that it represents and serves.

It is gratifying to know that work has at last been commenced on the excavation for the rapid transit subway in New York city. Very little has been done since the formal breaking of ground in the Spring, on account of the non-delivery of structural steel and iron materials which it is necessary to have on hand before proceeding with the excavations. A considerable delivery of these has been made, and it is thought that on several sections of the work construction will proceed actively from this point. While New York has grown as fast as any of the other large cities in the country, its growth has unquestionably been hampered by the difficulties of transit in the city itself. No improvement is more urgently needed, or more absolutely necessary for the general well being of the community, than improved rapid transit. While the elevated railway, with its new electrical equipment, will provide for this in some measure, the subway is needed also, and probably by the time it is finished it will be found hardly adequate to the demand for transit facilities.

The convention of the Association of Edison Illuminating Companies, held this week at Saratoga Springs, N. Y., was a gathering of a number of the strong men of the industry. The attendance was larger than it has been for years, and the programme of papers and discussions was of unusual interest and timeliness. While the proceedings of this convention are not given to the public, the papers on the programme, which we present in full on another page, are printed and sent to the members of the association, and a vast deal of important and instructive information thus reaches the field. President Lieb and his associates are to be congratulated on the undoubted success of the twenty-first convention of this association.

Anything concerning the gutta-percha industry is of interest to electrical manufacturers. The supply of this valuable material is so restricted that large electrical enterprises, such as the Pacific cable, are dependent to a marked degree on the question as to whether or not the necessary gutta-percha can be secured. The latest source of supply seems to be gutta-percha leaves. A firm in Singapore states that it manufactures, in this manner, gutta-percha that can not be told from the true gum. It requires, however, sixty-five tons of leaves to yield one ton of gutta-percha, and, as the leaves are not always to be had in sufficient quantities this source of supply can not be considered a very stable one. The inventor who can devise a satisfactory substitute for gutta-percha has his fortune made.

THE IMPORTANCE OF RELIABLE MUNICIPAL ELECTRICAL ENGINEERING.

In St. Louis, one night this week, two policemen were killed and 11 were injured by the crossing of an electric light wire on the patrol box wires running through a certain district of the city. When the unfortunate men went to turn in their report to headquarters, which the police rules require that they shall do at stated intervals by pulling a lever in the patrol box, they were severely shocked and two of them killed outright.

Pending fuller information as to the responsibility for the accident it is unwise to cast any reflections upon the electric light system or the method of wiring the patrol boxes, but one is naturally led to think what might have happened had an accident of this sort taken place during a season of riot or when a great conflagration was raging or at any other time when it was vitally important for the police to communicate immediately with their headquarters. We have grown accustomed, with the passing of time, to regard the fire-alarm and police telegraphs in a great city as beyond suspicion. This has been due to the intelligent labor of the superintendents of such telegraph systems who have generally maintained the instruments and circuits in their care in a condition of the highest possible efficiency and reliability. The accident at St. Louis is a subject that may well be considered at the forthcoming meeting of the Association of Municipal Electricians. The cost of providing and maintaining the very best possible apparatus and system is so small compared with the importance of its operation and the immense insurance guaranteed by its reliability, that it can not fairly be considered when such systems are planned. Protective electric circuits of one kind or another, such as fire-alarms, burglar-alarms, police wires, etc., have become so familiar that we rarely think of the vast property that they protect, or of the dreadful catastrophies that have doubtless, hundreds of times, been warded off and avoided by their silent and certain action. As population grows in cities and conditions of modern life become more complex, possibilities for disaster and loss likewise increase in the same ratio. Notwithstanding this, life and property are safer to-day in our cities than they have ever been before, and the reason is that at the same time electric protective devices have grown even faster in value, reliability and importance. There can be no doubt about the extreme value of the work done by the men represented in the Municipal Electricians Association. It is proper to say that in their care are the largest interests in proper and the greatest responsibilities for life and health reposed upon any officers of their respective municipalities.

The Paris Exposition seems to be approaching completion as it approaches the end of its term of existence. It is to be regretted that it has not achieved the same success which marked some of its predecessors and other international fairs held elsewhere in Europe and in this country. Perhaps the troubled aspect of international politics is responsible, in some degree, for the paucity of exhibits, and the small attendance at the exposition, but both of these may also be explained by the assumption that people are becoming tired of expositions. Indeed, the necessity for the exposition as a means of instruction and for bringing together the products of various manufacturing arts and exhibiting them to prospective customers has practically disappeared; the place of the exposition is taken very largely by the technical journal. Processes of illustration have reached such perfection, and under the stimulus of demand and competition the arts of descriptive writing and of advertising have so improved that the technical journal virtually brings the exposition to its readers.

The paper by Professor Herdt and Mr. Archibald, concerning the wave-form of alternating-current generators, which will be found on another page, is one of particular interest at this time, because so little attention has been given to this highly imporant subject. It has been held by some eminent members of the profession that the matter of wave form is one of small importance, but no one observing the curious double and triple-frequency effects exhibited in some of the diagrams, can fail to see that under some circumstances wave form may be of vast and vital importance. This is particularly true when the conditions of long-distance transmission are considered, where the high-frequency components of waves may, and frequently do, start resonant effects that may be highly detrimental or even dangerous. The subject is one that is well worthy of more careful attention than it has yet received, and it is to be hoped that the work outlined in the paper will be carried on further and more fully.

On another page will be found a description of the second annual military tournament and athletic games recently held near Long Branch, N. J., and participated in by members of the National Guard of the States of New York and New Jersey. These events were particularly interesting this year on account of the participation of the Signal Corps men in contests devised to illustrate their training and ability in building telegraph lines. It appears that the amateur soldier telegraphers have made a remarkably creditable showing, but they have a high ideal of performance set them by the extraordinary labors of the regular United States Army Signal Corps in the Philippine Islands, in Cuba, and elsewhere during the recent war. In the Philippines, the army signal corps has accomplished wonders, and though little is heard of their work it is of a kind in which every American may justly take great pride.

It is of the deepest interest to look back over the history of the applications of electricity in this country and to trace the rise of the art of electric lighting from its small beginnings. In the article by Mr. J. H. Vail, in the last ELECTRICAL REVIEW, will be found an exceedingly interesting history of the Edison electric light companies and their evolution from what was practically a small scale laboratory experiment made less than twenty-five years ago.

Everything points to a highly successful meeting of the American Street Railway Association, at Kansas City, next month. The advance programme, printed on another page, gives promise of an interesting convention.

A METER FOR MEASURING TRACTIVE FORCE ON ELECTRIC TRAMCARS.*

BY GISBERT KAPP.

A tube is mounted in the car parallel to the rails, with the ends turned up to form vertical branches. Let us imagine the line to be horizontal and the tube filled with water up to a certain point in the vertical branches, which we will consider the zero point. In order to be able to observe the water level the vertical branches are glass tubes. If the tube is inclined to the horizontal the water level changes proportionately to the tangent of the angle of inclination, and an experimental scale can be marked on the branches with points corresponding to gradients of 1 in 1,000, 2 in 1,000 up or down, the position of these points being ascertained by trial. The distance of these points apart depends on the width of the branches and the length of the horizontal tube. If the car is at rest on an incline, the apparatus being, as already remarked, mounted parallel to the rails, the water level indicates with sufficient accuracy the horizontal gravity component per ton of rolling weight.

The accuracy is not absolute, as the displacement of the water is proportional to the tangent, the gravity component on the other hand to the sine of the angle of inclination of the track. The error is, however, even on considerable inclines, quite inconsiderable. On an incline of five per cent the difference between sine and tangent is $\frac{1}{1\,5\,0}$, *i. e.*, 0.13 per cent, and on inclines of 10 per cent, the steepest allowable on any tram line, it is $\frac{1}{1\,8\,5}$ or 0.54 per cent. That proportion of the tractive force which serves to overcome the gravity component can, therefore, be directly read off on the graduated glass tube when the car is proceeding up a steady incline.

Let us now consider the car as moving with variable speed on a level track. The acceleration pressure acting on the horizontal column of liquid causes a displacement of the surface of the water. If l is the length of the horizontal tube and h the difference in height between the surface of the water in each of the vertical branches, we have the following relationship:

$$l\frac{p}{g} = h,$$

where p is the acceleration imparted to the car, and g the acceleration of gravity.

As $\frac{p}{g}$ is always less than l,

$$\frac{p}{g} = \sin \beta,$$

β being the angle through which the apparatus would have to be turned while at rest to produce the same displacement as has in this case been caused by acceleration on a horizontal track. That portion of the tractive force which goes to accelerate the car, may, therefore, be read off on the empirically graduated scale, the level of the water in this case indicating

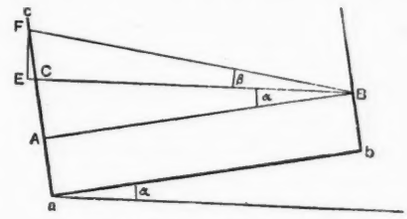


FIG. 1.—A TRACTIVE-FORCE METER.

both for the incline and the acceleration the necessary tractive force per ton of rolling weight.

The following consideration will serve to show the degree of accuracy obtainable in this respect:

In Fig. 1 let ab be the horizontal tube of length l, ac and ad its two vertical branches, a the angle of inclination of the track, and p the acceleration imparted to the tube in the direction of its length.

Let B and F be the water level in the two branches. Of the total difference of

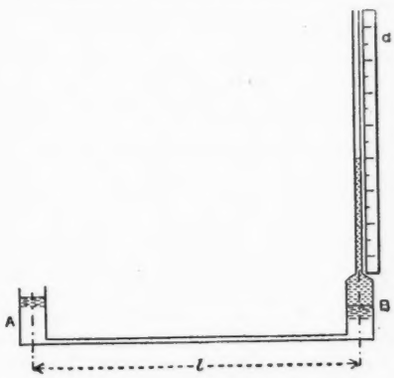


FIG. 2.—A TRACTIVE-FORCE METER.

level read off between the two, $AF = l \tan (a + \beta)$, $AC = l \tan a$ is that portion due to the incline, and $CF = \frac{EF}{\cos a}$ is that portion due to the acceleration, whence

$$EF = l\sqrt{1 + \tan^2 (a + \beta)} \sin \beta$$

$$CF = l\frac{\sqrt{1 + \tan^2 (a + \beta)} \sin \beta}{\cos^2 a}$$

The value of the expressions under the root may be taken as equal to unity without serious error. The tractive force read off on the scale is AF kg. per ton; the true tractive force is $1{,}000\left(\sin a + \frac{p}{g}\right)$ kg. per ton. Introducing an element of error which we will term $1{,}000f$, we have the equation, $l \tan (a + \beta) = 1{,}000f + 1{,}000\left(\sin a + \frac{p}{g}\right)$.

As the dimensions of the apparatus are without influence on the theory here developed of its limits of error, we can give to l any dimensions we please. If we make the tube 1,000 millimetres the scale divided into millimetres will show the tractive force in kilogrammes per ton. The above equation thus assumes the simpler form

$$\tan (a + \beta) = f + \sin a + \frac{p}{g}$$

$$\tan (a + \beta) = f + \sin a + \sin \beta$$

It is plain that the error is greater as the incline and acceleration increase. An average for the acceleration on street tramways will be 0.4, though occasionally it may amount to 0.75, a value which it will, however, not be likely to exceed on account of convenience to passengers. When putting on the brakes, and particularly the emergency brakes, this value may be considerably exceeded. When the apparatus is employed to determine the tractive force of the motor, the value $p = 0.75$ may be regarded as the limit. If the brake action is to be tested, a maximum retardation of 1.40 on a horizontal track must be assumed for the purpose of testing the limits of error.

Thus we have, with an acceleration of 0.4 and an incline of five per cent, $\sin a = 0.5$; $\sin \beta = 0.4/9.81$; $\sin a + \sin \beta = 0.0907$. If the apparatus were without error it should show a difference of level of 90-7 millimetres. In practice it shows a difference of level of 1,000 $\tan (a+\beta)$, which from the values above given comes out at about 91 millimetres. The apparatus, therefore, indicates 0.3 millimetres; *i. e.*, one-third per cent too much. In a similar way the error for other conditions of working can be estimated from the following tables for starting and braking obtained:

TABLE OF LIMITS OF ERROR IN STARTING.

Profile of track.	Horizontal.		Rising		Falling	
	—	—	50%	100%	50%	100%
Acceleration.....	0.4	0.75	0.75	0 4	0.75	0 4
Percentage error.	0.00	0.29	0.60	0.82	0.23	0 38

TABLE OF LIMITS OF ERROR IN BRAKING.

Acceleration.....	0.75	1.4	0.75	1.4	0.75	0.4
Percentage error.	0.26	1.03	0.23	0.80	0.60	0.82

In all cases the errors are either smaller or of the same order as the errors in reading so that the apparatus may be looked upon as thoroughly suited for practical purposes.

A further and greater source of error

*Paper read at the eighth annual meeting of the "Verband Deutscher Electrotechniker" at Kiel. Translated by the *Electrician*.

is due to the fact that in going up hill and in starting, the front springs of the car are more heavily loaded than the rear springs, while on running down hill and applying the brakes the opposite is the case. The result is that the tube *ab* does not remain perfectly parallel to the rails, but assumes a slight incline. The smaller the wheel base and the higher the centre of gravity of the car above the springs, the more the car will tend to tip under the influence of the tractive force, or of the retardation due to the brakes. The unequal distribution of the load may also cause a similar displacement. These are sources of error that depend upon particular circumstances, and can not be determined generally. Exhaustive calculations which I have made lead me to conclude that these sources of error may amount to several units per cent.

The apparatus indicates directly only that portion of the tractive force which is necessary for mounting the incline or producing the acceleration, not the remainder which is required for overcoming the friction resistance. To estimate this, the procedure is as follows: The car is set in motion on a length of track as nearly level as possible, and allowed to come to rest. The water level is read off, and indicates the retardation due to rails, gear, friction, etc. To eliminate the effect of any deviation from the horizontal, the test should be made running in each direction. The mean of the readings is the so-called traction coefficient expressed in kilogrammes per ton of rolling weight. When this coefficient has been determined it is only necessary to displace the scale by a certain fixed amount to enable the total tractive force to be read off.

The form of the apparatus just described is suited for being permanently fixed up in motor cars, the length of the tubes *ab* being as long as the frame of the car will allow, the vertical branches being brought up at any convenient spot. One of the upright tubes may be provided with a float adapted to operate a recording instrument for producing a permanent record on a paper strip mounted on a time-controlled drum in the ordinary way. In this way is obtained a curve of the tractive force as a function of the track. The integration of this curve is the work per ton of rolling weight. Instead of the water tube, a suitably graduated manometer may be employed. In any case, the apparatus constructed as above is not very portable, owing to the length of the tube *ab*. To obtain a portable apparatus I have employed two liquids—mercury, to produce the difference of pressure, and water to indicate it. The apparatus is shown in Fig. 2. AB are two pots of 40 millimetres in diameter, *l* is the connecting tube of such a length that the centres of the pots are separated by a distance of 50 centimetres. *d* is the water tube, the bore of which is five millimetres. With these proportions an incline of 0.1 per cent corresponds to a displacement of 4.7 millimetres, and as two millimetres can be read with accuracy, the tractive force may be determined within about 0.5 kilogramme per ton of rolling weight. Prolonging the tube *ab* would enable a greater degree of accuracy to be obtained, but the apparatus would then become too unwieldy. In addition, it would be useless, as, in the first place, too extreme a degree of accuracy is useless for practical purposes; and, secondly, it would be illusory, owing to the error due to the tipping of the car.

A much more convenient form of apparatus would be a bent spirit-level. As the water-level tube only indicates an angle of inclination, this might be shown by the air bubble in an equally bent level. But though I have had half a dozen made, I did not succeed in getting one to give anything like the accuracy of the apparatus shown in Fig. 2.

I have tested the apparatus on one of the Berlin tramways and on the high-speed line of Siemens & Halske, in Lichterfelde. The amount of damping down produced by the narrow tube *l* (bore 3 millimetres) proved to be adequate in cases of starting and ordinary braking, but too powerful for examining the effect of the emergency brake. It would be advisable to enlarge this tube and to employ a throttle valve to regulate the amount of damping required. For ordinary street trams the apparatus gave a traction coefficient of 12 kilogrammes per ton which rose to 20 kilogrammes on a sharp curve. On the high-speed railway, the apparatus was arranged inside a car destined for the Berlin overhead railway, and gave an acceleration pressure of 75 kilogrammes. As the under carriage is double-bogied, and the centre of gravity lies low, appreciable tipping can hardly occur, and an error on that account is not likely. The coming-to-rest experiments were carried out on a 0.3 per cent grade. Out of six double experiments (12 readings) and speeds varying from 13.5 kilometres to 30.7 kilometres per hour, the traction coefficient varied between the narrow limits of 8.0 and 8.1 per ton. The day was calm. It appears, consequently, that air resistance has not much influence on speeds up to 30 kilometres per hour. The increase in the coefficient caused by a curve of 200-inch radius amounted to 1.5 kilogrammes. The car was quite new, and had not run long enough to ease the parts, and after the experiments it was found that one of the brake blocks was warm, which may account for the high coefficient of 8 kilogrammes.

THE EDISON CONVENTION.

A VERY SUCCESSFUL MEETING AT SARATOGA SPRINGS.

AN INTERESTING PROGRAMME PRESENTED AND DISCUSSED — LIST OF COMMITTEES AND DELEGATES—CONVENTION NOTES.

The Association of Edison Illuminating Companies held its twenty-first convention at the Grand Union Hotel, Saratoga Springs, N. Y., this week. The first convention was held in 1885, and every meeting since that date has been the source of valuable and important contributions to the technical and practical literature of the industry. The meeting at Saratoga Springs was not different from former ones in the excellent work done. There was an attendance of some 90 persons. Only those who are active members participate in the discussions and attend the sessions, and the papers are not published as a rule, except for private circulation among the members of the association.

President J. W. Lieb, of New York, called the meeting to order Tuesday morning, and the following programme was promptly begun and carried through on time with scarcely a change:

Opening Session.

TUESDAY, 10.30 A. M.

Roll Call.
President's Address.
Election of New Members.
Reports of Committees.
Notes on the Electrical Features of the Paris Exposition, by Mr. W. C. L. Eglin, Philadelphia.

Second Session.

TUESDAY, 2 P. M.

Paper: "A Forty-Thousand-Volt Transmission as a part of an ordinary Central Station System," by D. L. Huntington, Spokane.
Report of Lamp Committee.
Report of Lamp-Testing Bureau.
Paper: "The Past, Present and Future of the Incandescent Lamp," by Mr. John W. Howell, Harrison, N. J.

Third Session.

TUESDAY, 8 30 P. M.

Papers: "Results Obtained from the Maximum Demand System of Rates," by Mr. A. S. Knight, Boston.
"Residence Rates in Detroit," by Mr. Alex Dow, Detroit.

Fourth Session.

WEDNESDAY, 9.30 A. M.

Papers: "Polyphase Distribution," by Mr. G. Semenza, Milan.
"25 Cycles *vs.* 60 Cycles in Union Lighting Stations," by Mr. Henry G. Stott, Buffalo.
"Systems and Apparatus for Lighting and Power Distribution," by Mr. C. P. Steinmetz, Schenectady.

Fifth Session.

WEDNESDAY, 2 P. M.

Papers: "Electric Elevators; Some Comparisons," by Mr. Arthur Williams, New York.
"Electric Elevators and Conveyors," by Mr. John F. Gilchrist, Chicago.
"The Year's Improvement in Meters and Measuring," by Mr. Caryl D. Haskins, Schenectady.
Report of Meter Committee.

Sixth Session.

THURSDAY, 9.30 A. M.

"Efficiency of Electric Distributing System," by Mr. Philip Torchio, New York.

"A Comparison of Arc-Lighting Systems," by Mr. Walter C. Fish, Lynn, Mass.

The committees reporting to the convention were named and titled as follows:

Committee on Incandescent Lamps (Sub-Committee of Executive Committee): John W. Lieb, Jr., Chairman, New York, N. Y.; W. S. Barstow, Brooklyn, N. Y.; Chas. L. Edgar, Boston, Mass.

Committee on Grounding of the Neutral: W. S. Barstow, Chairman, Brooklyn, N. Y.; Robert Lindsey, Cleveland, Ohio; Henry G. Stott, Buffalo, N. Y.

Committee on Welsbach Light and Acetylene Gas: E. A. Leslie, Chairman, New York, N. Y.; Wm. Chandler, Sault Ste. Marie, Mich.; Geo. A. Redman, Rochester, N. Y.

Committee on Meters: Alex. Dow, Chairman, Detroit, Mich.; Louis A. Ferguson, Chicago, Ill.; John W. Lieb, Jr., New York, N. Y.

Committee on Automobiles: Louis A. Ferguson, Chicago, Ill.; W. S. Barstow, Brooklyn, N. Y.; W. C. L. Eglin, Philadelphia, Pa.

Press Committee: Alex. Dow, Chairman; W. H. Johnson, Wilson S. Howell.

The delegates reporting at roll call and during the meeting were the following:

B. E. Sunny, General Electric Company, Chicago, Ill.; Herbert A. Wagner, Missouri Edison Electric Company, St. Louis, Mo.; Geo. A. Redman, Rochester, N. Y.; Geo. D. Rosenthall, General Electric Company, St. Louis; J. W. Reeves, superintendent, Johnstown Electric Light Company, Johnstown, Pa.; Thomas G. O'Dea, Edison Electric Light and Power Company, Erie, Pa.; J. W. Ellard, manager United Electric Light and Power Company, Baltimore, Md.; H. T. Edgar, manager Edison Electric Illuminating Company, Brockton, Mass.; G. W. Brine, secretary and treasurer Edison Illuminating Company, Atlanta, Ga.; Charles L. Edgar, president Edison Electric Illuminating Company, Boston, Mass.; C. C. Perry, secretary and treasurer Indianapolis Light and Power Company, Indianapolis, Ind.; A. W. Field, secretary and manager Columbus Edison Electric Light Company, Columbus, Ohio; J. W. Lieb, Jr., vice-president and general manager Edison Electric Light Company, New York; J. R. Lovejoy, Schenectady Illuminating Company, Schenectady, N. Y.; Leon H. Schercke, Edison Electric Company, New Orleans, La.; W. F. White, general manager Cincinnati Edison Electric Company; E. J. Bechtel, superintendent Toledo Consolidated Electric Company, Toledo, Ohio; D. L. Huntington, secretary and general manager Washington Water Power Company, Spokane, Wash.; E. B. Greene, superintendent Edison Electric Illuminating Company, Altoona, Pa.; Ernest H. Davis, treasurer Edison Electric Illuminating Company, Williamsport, Pa.; Daniel McCoy, president Edison Light Company, Grand Rapids, Mich.; F. M. Noecker, general manager Renovo Edison Light Heat and Power Company, Renovo, Pa.; Henry G. Stott, engineer, Buffalo General Electric Company, Buffalo, N. Y.; Wm. Chandler, vice-president and secretary Edison Sault Electric Company, Sault Ste. Marie, Mich.; G. K. Hutchins, United Electric Light and Power Company, Baltimore, Md.; G. F. Perin, United Electric Light and Power Company, Edison Illuminating Company, Baltimore, Md.; Louis A. Ferguson, Chicago Edison Company, Chicago, Ill.; Wilson S. Howell, secretary, Harrison, N. J.; H. M. Edwards, auditor Edison Electric Illuminating Company, New York; Arthur Williams, general inspector Edison Company, New York; Hoyt Post, director Edison Illuminating Company, Detroit, Mich.; Robt. A. Cantor, director Edison Electric Company, New York; Calvin W. Rice, Edison Electric Illuminating Company, New York; A. P. Jenks, General Electric Company, New York; Samuel Insull, Chicago Edison Company; P. O. Keilholtz, consulting engineer, United Electric Light and Power Company, Baltimore; Charles R. Price, treasurer, New Bedford Gas and Edison Electric Light Company; Philip Torchio, New York Edison Company; Luther Stieringer, Boston Edison Company; Arthur F. Walker, superintendent Edison Light Company, Grand Rapids, Mich.; L. G. White, superintendent Columbus Edison Electric Company, Columbus, Ohio; Chas. R. Stetson, president and general manager; J. T. Maxwell, president Edison Electric Light Company, Philadelphia, Pa.; Geo. Ross Green, Edison Electric Light Company, Philadelphia, Pa., engineer motor department; W. H. Johnson, Edison Company, Philadelphia, Pa.; F. P. Cox, General Electric Company, Lynn, Mass.; Chas. T. Hughes, New York manager General Electric Company, New York city; H. W. Hillman, General Electric Company, Schenectady, N. Y.; Chas. P. Steinmetz, General Electric Company, Schenectady, N. Y.; W. S. Andrews, General Electric Company; J. W. Howell, engineer lamp works, Harrison, N. J.; Joseph D. Israel, Philadelphia Edison Company; Caryl W. Haskins, General Electric Company, Schenectady, N. Y.; E. H. Mullin, General Electric Company; F. W. Wilcox, assistant to manager incandescent lamp sales, General Electric Company, Harrison, N. J.; Alex Dow, Edison Illuminating Company, Detroit, Mich.; Henry L. Doherty, assistant to president, St. Paul Edison Company; W. S. Barstow, general manager, Edison Electric Illuminating Company, Brooklyn; John F. Gilchrist, Chicago Edison Company; Henry W. Darling, president Des Moines Edison Light Company, Des Moines, Iowa; Geo. P. Magner, manager Newport Illuminating Company, Newport, R. I.; Geo. E. Emmons, General Electric Company, Schenectady, N. Y.; Thos. E. Murray, New York Company; General Eugene Griffin, General Electric Company; W. F. White, general manager Cincinnati Edison Electric Company; W. C. D. Eglin, Philadelphia Edison Company, Philadelphia, Pa.; W. H. Wirt, General Electric Company, Schenectady; T. D. Boyles, General Electric Company, Schenectady; Fred M. Kimball, General Electric Company, Boston; Chas. R. Huntley, Buffalo General Electric Company, Buffalo, N. Y.

President Lieb's address was delivered extemporaneously and was received with much enthusiasm.

On motion of Mr. Insull it was voted to request Mr. Lieb to give out for publication portions of his address.

CONVENTION NOTES.

Mr. Eglin's "Notes on the Paris Exposition" related chiefly to the Nernst lamp.

Dr. W. M. Habirshaw was a visitor at Saratoga Springs, and renewed his acquaintance with the delegates to the convention.

Mr. Luther Stieringer was, as many times in the past, elected sergeant-at-arms and performed his duties with grace and ability.

Mr. James P. McQuaide, of the National Conduit and Cable Company, was present in person and gave out as a souvenir an ebony-handled pencil that was appreciated by all the visitors.

The three special papers read Wednesday morning were discussed as a whole. Mr. Steinmetz was warmly congratulated over his able address entitled "Systems and Apparatus for Lighting and Power Distribution."

The beautiful drives around Saratoga were greatly appreciated by the ladies of the delegates, who were present in large numbers. Receptions were also held at the golf club, and in many ways were the ladies well provided with entertainment.

The nominating committee recommended but few changes in the list of officers; Mr. A. W. Field, of Columbus, Ohio, to succeed Mr. William Chandler as vice-president, and W. C. L. Eglin, of Philadelphia, to succeed Mr. W. H. Johnson as a member of the executive committee.

The ELECTRICAL REVIEW's account of the Association of Edison Illuminating Companies was highly commended. Copies of the last issue were in the hands of all the delegates. The interesting review by Mr. J. H. Vail, which appeared in that issue, was most favorably commented on.

PERSONAL.

Mr. Morris W. Mead, superintendent of the Bureau of Electricity, of Pittsburgh, visited New York city this week. Mr. Mead reports that the forthcoming meeting of the Association of Municipal Electricians will be a great success and of benefit to all its members.

CONDITIONS AFFECTING THE WAVE FORM OF ALTERNATORS.*

BY L. A. HERDT AND E. M. ARCHIBALD.

In what is given below it is not intended to consider the question of wave

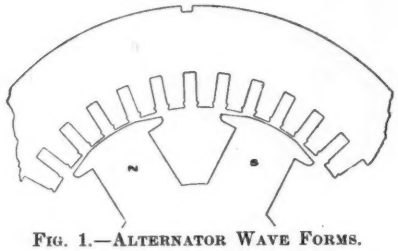


FIG. 1.—ALTERNATOR WAVE FORMS.

form as affecting successful distribution, but rather the extent to which the electro-motive force wave of certain machines may change under not unusual commercial conditions.

In alternator specification, along with regulation, heating and other clauses, it is often argued that a clause relating to wave form should be included, but as comparatively little is known of the extent to which the wave forms of modern

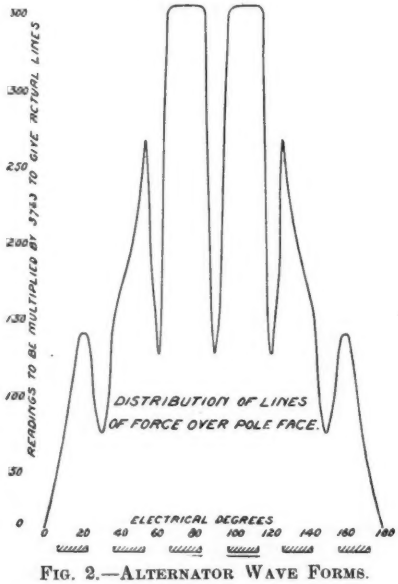

READINGS TO BE MULTIPLIED BY 3743 TO GIVE ACTUAL LINES
DISTRIBUTION OF LINES OF FORCE OVER POLE FACE.
ELECTRICAL DEGREES
0 20 40 60 80 100 120 140 160 180

FIG. 2.—ALTERNATOR WAVE FORMS.

alternators change with amount and character of load—to say nothing of the effect of such changes on the operation of the receiving machinery—it seems advisable that more information be accumulated before very rigid wave form requirements are inserted. However, with a view of throwing more light on the subject, a series of experiments were undertaken in the electrical engineering laboratories of McGill University during the past Winter, and, though not complete, certain results already obtained may be of interest.

*A paper read before the Canadian Electrical Association, August 30, 1900.

For the purpose in hand a number of different types of alternators were available, some with concentrated armature winding, and some with distributed windings of the revolving armature, revolving field and inductor types. The electro-motive force waves were obtained from each at different field excitations, different armature currents and different power factors, lagging and leading. The distribution of induction in the air gaps under different conditions was also obtained by means of small test coils suitably placed. As illustrating the general effect of lagging and leading armature currents in relation to type of machine upon induction distribution and consequent wave form, the results obtained upon a revolving field distributed winding alternator, part of the magnetic circuit of which is shown in Fig.1, and upon an inductor type machine with a concentrated winding and poorly shaped inductor lug, shown in Fig. 3, may be cited.

In Fig. 2 is seen the distribution of induction in the air gap of the first machine for the particular position of the field pole shown. As might have been expected, the larger part of the induction enters the armature through the teeth, but about one-third, in the case of those teeth immediately opposite the pole, passes into the armature by way of the slot due to the practical saturation of these teeth. The no-load electro-motive force wave of each coil of the distributed winding may be constructed from the no-load induction distribution curve by the method of tangents and for any group of coils by taking the algebraic sum of the instantaneous electro-motive forces of the individual coils. This has been done and the results found to check quite well with experimental values.

Fig. 4 gives a series of electro-motive force waves of the same machine connected as a single-phase alternator at no-load and full current load of different power factors, lagging current; the field excitation being kept constant.

Fig. 5 shows the electro-motive force waves of the same machine connected as a quarter-phase generator under similar conditions. It is to be noted that while the wave form and terminal volts both change in a marked degree with power factor, the change is not nearly so great as in the case of the second machine having a concentrated winding and comparatively weak field.

With a concentrated winding the conditions are different, the wave form not being a function of the angular displacement of the armature coils.

In Fig. 6 is given the no-load induction distribution in machine No. 2 at normal field excitation. It is to be noted that, due to poor design, the armature induction at minimum points is a considerable fraction of its minimum value, which would not be the case in rightly proportioned machines of this type. With this machine also the no-load wave form was readily predetermined from the curve of induction distribution and found to agree with the experimental values.

In Fig. 7 is shown the no-load and load electro-motive force waves at differ-

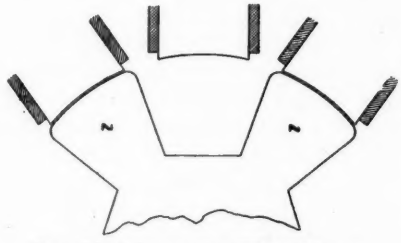


FIG. 3.—ALTERNATOR WAVE FORMS.

ent power factors. The change of wave form with character of load is, to say the least, startling, especially to those who have been accustomed to regard the sine wave assumption as to alternating electro-motive force sufficiently near for practical purposes. The effect upon the

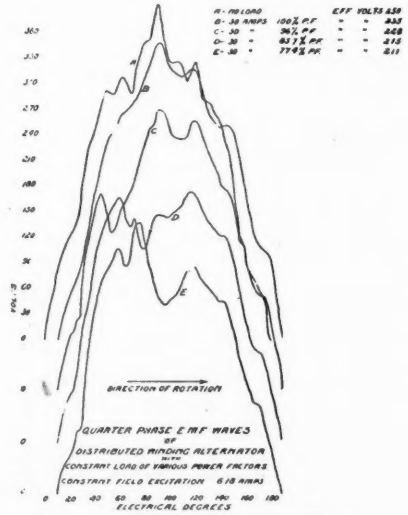

A- NO LOAD
B- 30 AMPS 100% P.F.
C- 30 " 96% P.F.
D- 30 " 83% P.F.
E- 30 " 77% P.F.
EFF VOLTS 459
" " 433
" " 408
" " 415
" " 411
DIRECTION OF ROTATION
QUARTER PHASE E.M.F. WAVES OF DISTRIBUTED WINDING ALTERNATOR WITH CONSTANT LOAD OF VARIOUS POWER FACTORS CONSTANT FIELD EXCITATION 6.18 AMPS
ELECTRICAL DEGREES
0 20 40 60 80 100 120 140 160 180

FIG. 4.—ALTERNATOR WAVE FORMS.

operation of synchronous and induction machinery designed for sinusoidal electro-motive force's of such waves as shown can be pretty well anticipated. Several synchronous motors were in turn operated from a generator whose wave form was made to vary by changing the character of the auxiliary load. In every case, as might be expected, the energy absorbed and the idle current to the motor increased with dissimilarity

of wave. Also the tendency to fall out of step with slight provocation was very marked when the wave shapes were greatly different, but as above indicated, such experiments are not yet complete. It is

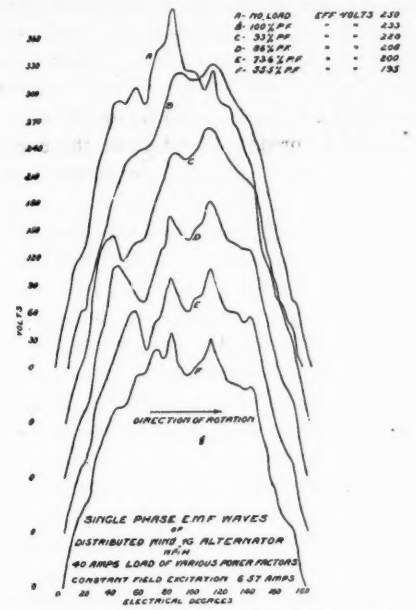

A- NO LOAD EFF VOLTS 230
B- 100% PF " " 233
C- 33% PF " " 220
D- 95% PF " " 208
E- 73.6% PF " " 200
F- 55.5% PF " " 195
VOLTS
DIRECTION OF ROTATION
SINGLE PHASE E.M.F. WAVES OF DISTRIBUTED WINDING ALTERNATOR WITH 40 AMPS. LOAD OF VARIOUS POWER FACTORS CONSTANT FIELD EXCITATION 6.57 AMPS.
ELECTRICAL DEGREES

FIG. 5.—ALTERNATOR WAVE FORMS.

hoped, however, that enough has been said to induce a discussion of this certainly important subject, particularly from the standpoint of the purchaser and operator of alternating-current apparatus.

We desire to acknowledge our indebted-

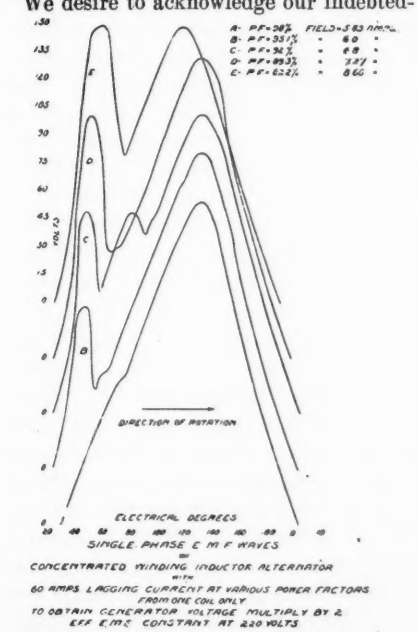

A- PF=98% FIELD=5.83 AMPS.
B- PF=95.1% " 6.0 "
C- PF=74% " 6.8 "
D- PF=89.3% " 7.27 "
E- PF=82.2% " 8.66 "
VOLTS
DIRECTION OF ROTATION
ELECTRICAL DEGREES
SINGLE PHASE E.M.F. WAVES
CONCENTRATED WINDING INDUCTOR ALTERNATOR WITH 60 AMPS. LAGGING CURRENT AT VARIOUS POWER FACTORS FROM ONE COIL ONLY
TO OBTAIN GENERATOR VOLTAGE MULTIPLY BY 2
EFF. E.M.F. CONSTANT AT 220 VOLTS

FIG. 8.—ALTERNATOR WAVE FORMS.

ness to Professor R. B. Owens for the suggestion of the work carried out and for valuable assistance.

The movement to establish a new telephone line from Princess Anne to Deal's Island, Chance, Dame's Quarter and Oriole, Del., is being pushed by a company, who, it is reported, have already secured about $600 to further the enterprise.

VIEWS, NEWS AND INTERVIEWS

One effect of London's new electric underground road has been to cut down the receipts of restaurants near the Stock Exchange. The brokers now find it pos-

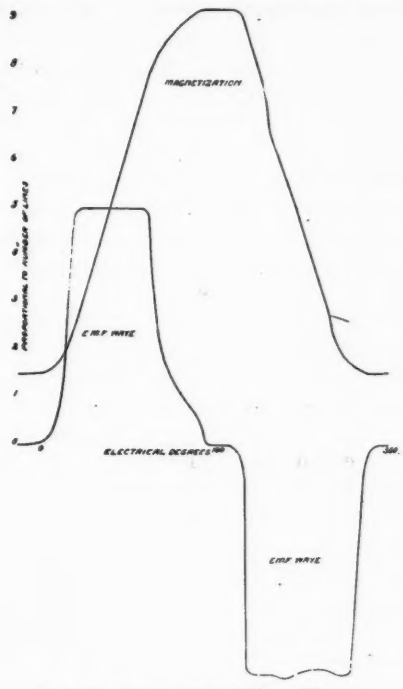


FIG. 6.—ALTERNATOR WAVE FORMS.

sible to reach the fashionable West End restaurants in the lunch hour.

A local electromobile stage service has been established at Sea Gate, New York harbor, a fashionable and restricted Summer colony. The Electric Vehicle

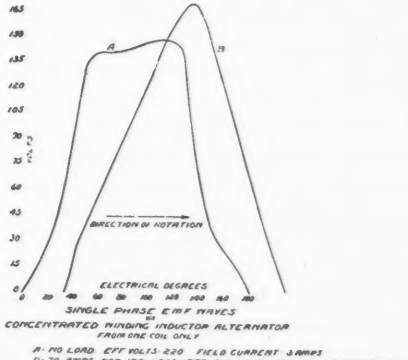

A
B
DIRECTION OF ROTATION
ELECTRICAL DEGREES
SINGLE PHASE E.M.F. WAVES
CONCENTRATED WINDING INDUCTOR ALTERNATOR FROM ONE COIL ONLY
A- NO LOAD EFF VOLTS 220 FIELD CURRENT 3 AMPS
B- 70 AMPS. NON-IND LOAD EFF VOLTS 220 FIELD CURRENT 6 AMPS

FIG. 7.—ALTERNATOR WAVE FORMS.

Company's electromobiles, each seating six persons are used.

Colorado College has received $100,000 for a new science building. Dr. J. C. Shedd, instructor in physics at the University of Wisconsin, has accepted the professorship of physics at Colorado College, to succeed Dr. S. J. Barnett, who goes to Stanford University.

Ambitious mechanics who desire to obtain better positions and higher wages should investigate the many advantages afforded by the correspondence method of instruction in the theory of the trades and engineering professions. Without leaving home or losing time from work, the student pursues a thorough course of study under the direction of able instructors who are always ready and willing to assist him. Instruction papers, prepared especially for teaching by mail, are furnished free. These papers, written in clear and concise language as free as possible from technicalities, are much superior to ordinary text-books on the subjects of which they treat. In addition, special information regarding any difficulties in their studies, is furnished students without extra charge. It should be the ambition of every man to advance in his trade or profession. A mechanic with practical experience supplemented by theoretical education can command a better position than a man without such an education. The result of long experience in teaching by mail show that no other method so fully meets the requirements of men who have but little time for study.

"I had a funny experience when I first went to Canada," said a well-known telephone engineer who is operating a large exchange in the Province of Quebec. "As you know, Quebec is the headquarters of the French-Canadian and in the eastern part of the Province there are many people who speak no English; in fact, there are whole towns full of them. One day I had to go on important business to a little town which we call Ste. Therese. When I found my man there I found also that he could neither speak nor understand English, nor did I at that time know a word of the peculiar lingo that the 'habitant' calls French. What to do I did not know, as no interpreter could be found, and finally, in desperation, I called up the Montreal office and asked for somebody who knew both languages. He came to the telephone, and I told him what I wanted to say to my French friend; he repeated it to him over the telephone, received the reply and translated it for me into English. In this way we maintained a satisfactory conversation for about half an hour, the interpreter being a good many miles distant from the two men for whom he was rendering his services. I do not know when the telephone has ever been put to a test like this before to show what a polyglot instrument it is."

THE ELECTRIC RAILWAY IN BIRMINGHAM.*

BY MARSHALL HALSTEAD.

The Birmingham city council has recently granted the tram company the privilege of using experimentally, on one line, the overhead electric trolley street car system. This may be running in a year. At present, a tramway overhead pole exhibition is being given along the proposed route. A side instead of an overhead street wire will probably be adopted. The Birmingham Tramway Company is, by the way, controlled by Toronto capitalists, who came over here about four years ago and picked up at a low figure the few steam tram lines, thinking they could obtain immediate permission to convert them into electric lines, extend the service, increase the number of routes and profit greatly by giving this city a very much needed means of transportation; but until quite recently there has been no public opinion to assist in this matter, because the general public has been and is without the slightest conception of what a good electric street car system means to great cities, and there exists on the part of the municipal authorities a determination, necessarily obstructive for the present, to have a city ownership of all the street car lines.

Among the difficulties to be encountered under the latter, not the least serious is the increasing difficulty to command money for public purposes at the extremely low rates hitherto current. Up to three years ago, it was possible to sell the bonds of the best-managed British cities on a two and three-quarters per cent basis at par, while nearly all cities were able to obtain money in unlimited sums at three per cent. The late treasurer of Birmingham, Mr. W. R. Hughes, who died in November last, having been 27 years in office, gave it as his opinion that English cities would never again see such cheap money, while the chairman of the finance committee, in a speech in the city council, recently expressed the same opinion. The lowest rate is now three and one-eighth per cent and the average not far from three and one-half per cent, with a continual tendency to increase.

During the recent month Nottingham, one of the most progressive of British cities, has been asking only 95 for a new three per cent loan, while Bristol has been asking 97 and the London county council 97½, and Manchester is advertising in the *Times* offering to borrow at three and one-eighth per cent, or, as it is put here—in a long-hand way—at £3 2s. 6d. per cent.

It would be hard to say how much of this is due to the rapid growth of local indebtedness or how far it has been brought about by the fear of the municipalizing movement. The most forcible argument of the advocates of municipal ownership has been the fact that cities could borrow money for great undertakings at much lower rates of interest than private corporations. The success of municipal ownership in one thing quickly brings forth demands for municipal ownership of everything else in sight, and this fear of the municipalization tendency exists very largely with serious thinking people. I feel sure their views would find an active public expression if it were realized that the ultimately perfect and complete electric street car system for Birmingham would mean the employment of from three to four thousand —perhaps more—additional men as public servants. The statement of one who has seen all the best electric street car services in the United States and on the continent of Europe, that thousands of employees would be needed to handle a Birmingham tram system of the same proportional development, and that this development was sure to follow an introductory electric system, would undoubtedly meet with the disbelief and derision of the unknowing here. Equally absurd would the Birmingham gentlemen who drive to business in their own vehicles think it if it were asserted that they would, soon after the introduction of modern street cars, abandon their carriages to their wives for purposes of display and catch a tram car whenever they came to town, and that there would be even a larger night attendance at their fashionable clubs.

The facts in the experience of cities in other civilized countries have absolutely no value for consideration in Great Britain. Glasgow sent a commission to study the street car systems of the cities of the United States, Germany, France and Austria-Hungary, and after its return and favorable report, built merely an experimental line. The experience of the rest of the intelligent world meant nothing to the citizens of Glasgow, though the necessity of the Glasgow mind for experimenting with what others had perfected would cause years of delay in the completion of a proper tramway system. Birmingham cares nothing for the newly-acquired tramway experience of Liverpool, and is not at all interested in the fact that in neighboring little Coventry there is rather a nice tramway line or that in the adjacent Black Country there are several rather effective lines. In the Birmingham newspapers the other day, the guard rail of an experimental open Summer car of the one cable line is described as a novelty, and the fact that the conductor collects fares along the footboard is thought a queer but new proceeding. It is hard to see how a car builder could base his ideas on the type of car we know and produce anything as ugly, on lines so inartistic, as is this new car. There seems to be no conception of the fact that a tram car can be made as attractive a feature of street life as is the best-appointed lady's brougham. Tram cars all over Great Britain are painted a dull red mud color, intended for chocolate. From the reports of the appearance of our bright-colored street cars they fear a circus effect, and yet this is all a matter of custom. These dull paints were used here originally because they were thought economical, and it is not recognized that bright colors are now so chemically made that they are really more permanent, and that cars painted light inside and bright outside create a standard of cleanliness important in tramway operations.

The calculations in tramway matters in Birmingham include only the existing lines, and there is no anticipation that the number of these will, as all experience shows they must, be multiplied many, many times, through the force of a public opinion which is bound to come after the people have experienced the pleasure and profits of even one electric line. Thirty to 40 electric lines using from 20 to 50 cars each and 200 miles of electric service is, of course, "absurd." This public opinion is already asserting itself to the embarrassment of the city authorities of Liverpool, several creditable street car lines having been in operation there for some time. The people of those sections of Liverpool not now enjoying the benefits of the new wonder and delight have a several thousand volt impatience to be taken care of, but the legally financial restrictions of the city allow of only the step-by-step plan of building one line at a time, although the financial returns from the existing lines would be quite sufficient to the ordinary courageous capitalist to warrant an immediate and wholesale extension. The people of Liverpool have already manifested, by letters in the local papers, impatience at the speed restrictions imposed by the (national) board of trade, and they may soon think, as we are credited with doing, that "if people are foolish enough to get in the way of rapidly moving street cars, they can not complain after they have been killed."

*From the United States Consular Reports.

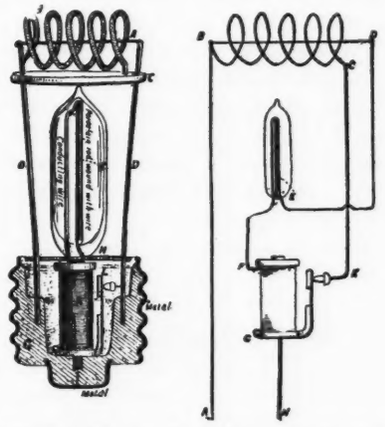
The Nernst Lamp at the Paris Exposition.

One of the most interesting displays in the Electrical Palace is that of the Nernst lamp, shown in the pavilion erected by the Allgemeine Elektricitäts Gesellschaft. Two different types of the Nernst lamp are made at present; in the first it is necessary to heat the conducting filament by a match, or alcohol lamp or the like. The general appearance of this type of lamp will be seen in our engraving. From the base project two metal rods, which are braced at the ends by a short tube of porcelain, and to the ends of the rods is soldered a rather thick platinum wire; to this wire the ends of the conducting filament are soldered by a process analogous to that employed for the incandescent lamp. This filament, made up of refractory oxides, is perfectly white and homogeneous, resembling otherwise a short carbon filament, says the *Scientific American*. As the resistance of the filament diminishes when in a state of incandescence, it becomes necessary to insert a resistance in the circuit to cut down the current to the right amount.

The form of resistance used here is shown below the porcelain rod; a very fine platinum wire is wound around a porcelain rod about one inch long, and this is contained in a small glass bulb; the outer end of the wire is connected with a stout wire which passes back parallel to the rod. The terminals are formed of two wires fused into the glass. A lamp base of the ordinary Edison, or screw type, is used, to which is fitted a globe somewhat resembling an ordinary incandescent lamp globe; this, however, is open at the end and serves only to protect the filament from dust, etc. When the flame of a match is applied to the filament, it soon commences to glow, and finally reaches a brilliant incandescence, giving off a white light which is very pleasing in color. The light is much whiter than that given by a carbon filament, owing to the higher temperature of the refractory oxides, and is entirely free from the disagreeable green hue of the Welsbach burner.

It is, of course, quite desirable to have a lamp which is entirely automatic in its action, particularly when it is placed in inaccessible positions, and accordingly an automatic form has been devised, in which the filament is heated by the passage of current through an exterior conductor, and when its resistance has been thus reduced and it allows the passage of a sufficient current to bring it to incandescence, the circuit of the heating conductor is interrupted by a special device. The general disposition of the working parts is seen in the sectional view. From the socket rise two stout wires, *D D*, which support a porcelain disk, *C*. Upon the disk is supported the filament, *A*, and surrounding it is a spiral tube of porcelain, *B*. The porcelain tube carries on its surface a great number of turns of fine platinum wire, which has been wound on while the tube is still straight and before baking the porcelain; the wire is almost completely imbedded in the porcelain and is visible only upon close examination.

The exterior tube serves to heat the filament by the passage of current in the fine platinum wire; a thick wire, not shown in the diagram, passes below from the right-hand end. A small glass bulb placed below contains the resistance wire, wound around a porcelain rod, *E*. This resistance is of the same type as for the first lamp, only one form being used throughout. The lamp base, *G*, resembles the ordinary screw type, but the interior body, of porcelain, is recessed to receive the automatic cutout device; it also supports the wires, *D D*. The cutout consists of a small electromagnet, *F*, fitting in the cavity of the socket; the upper end of the bobbin is of soft iron, and below an iron piece curves up and supports a small armature, *L*, by means of a flat spring. The armature rests normally against a contact piece to the right, but when a sufficient current passes in the coil, the armature is attracted and leaves the contact point, thus cutting off the current from the heating spiral. The action will be clearly seen by referring to the diagram of the electrical connections. The current takes two paths; first, through the filament, the resistance bulb and the magnet, following the circuit, *A, B, D, E, F, G, H;* or, second, through the heating spiral, the contact, *K*, the armature of the magnet and return, or *A, B, C, K, H*. Owing to the high resistance of the filament when cold, the current passing in the circuit of the magnet is not sufficient at first to attract the armature, but a few seconds after it is turned on the spiral commences to heat up, and the temperature of the filament is raised sufficiently to allow a large current to pass; it thus becomes incandescent, and, its resistance being lowered, a large current passes in the magnet; the armature is attracted and the circuit of the heating spiral broken at *K*. When the lamp is turned off, the reverse action takes place; contact is made at *K*, restoring the original conditions.



SECTIONAL VIEW AND WIRING DIAGRAM OF AUTOMATIC TYPE NERNST LAMP.

The price of a lamp with the automatic illuminating device is, of course, much higher than for the ordinary type, on account of the two extra pieces, the magnet and the heating spiral. The magnet, of course, does not deteriorate; the spiral, being subject to alternate expansions and contractions, lasts a reasonable length of time, but not indefinitely. It is, however, easily replaced, and is taken back for two-thirds of its original value. It is probable, besides, that the platinum wire will be replaced by a material which will give the same service at a less cost. The parts of the lamp which need to be replaced, the spiral and the filament, cost but little, and it is estimated that the cost of lamp renewals is not greater than in the case of the ordinary incandescent lamp. The duration of the filament depends somewhat upon the manner in which it is brought to incandescence, whether heated quickly and thus subjected to a violent rush of current, etc. In general, it is less than that of a carbon filament; if the changes in voltage do not greatly exceed the normal, one may count upon an average life of 300 hours for this lamp. The life is diminished gradually by a molecular change, which is produced little by little under the action of heat, accompanied by a diminution of solidity and often an increase of resistance which diminishes its brightness. The expenditure of energy in the present type of Nernst lamp is from one and one-half to one and three-quarters watts per candle-power, which is about one-half that of an incandescent lamp; for a 16 candle-power lamp the energy consumed is thus from 24 to 28 watts, representing 27 to 30 lamps per horse-power. At present the Nernst lamp is manufactured for 25, 50 and 100 candle-power, under a tension of 110 or 220 volts.

Mr. H. H. Harrison, of New York city, who is very well known among electrical men, sailed for Europe on Wednesday of this week.

SCIENCE BREVITIES

Artificial Radio-Activity—One method by which light may be shed upon the origin of Becquerel rays consists in endeavoring to produce them in an ordinary body by some known process. This has been accomplished by M. P. Villard, who succeeded in rendering ordinary bismuth radio-active by subjecting it to the action of cathode rays in a vacuum tube. The best results are obtained by employing the metal as an anode and anti-cathode combined, says M. Fournier d'Albe. Those parts upon which the cathode rays impinge in the greatest intensity are the most active. Success is also attained by making the bismuth the cathode. But, then, the region whence the cathode rays emerge becomes the least active. This is not surprising, since the rays emitted by radio-active bodies probably consist of negatively charged particles. Powdered bismuth and bismuth deposited by cathode rays can also be made radio-active by this process. The radio-activity obtained is very feeble, and inferior even to that of uranium. It is, however, sufficiently intense to verify the properties of the rays photographically, and to show that they are essentially the same as those of uranium. They are also very stable, and show no decrease within a month. It remains to compare this artificial radio-activity with the induced activity discovered by the Curies. In any case much of the mystery of these rays has been now solved.

Motion through the Ether—The greatest difficulty hitherto presented by the undulatory theory of light lies in the motion of ponderable bodies through infinite space occupied by an elastic solid. Lord Kelvin has approached this difficulty by a supposition which is at variance with the idea of the incompressibility of the ether, but which suggests a conceivable explanation of the difficulty, and throws some light on aberration and refraction, says the *Electrician*. He supposes that each atom acts on the ether within it and around it "according to the old-fashioned eighteenth century idea of attraction and repulsion." Also that "the distribution of positive and negative density of the atom, and the law of compressibility of the ether is such that the average density of the ether within the atom is equal to the undisturbed density of the ether outside." He then proceeds to investigate the probable distribution of the ether within the atom, and the stream-lines of the ether through the atom when the latter moves through the ether. He finds that a density of ether in the centre of the atom considerably greater than 100 times the density of undisturbed ether is required to make the refractivity as great as that of oxygen. A difficulty is offered by Michelson and Morley's proof that the atmosphere carries the ether along with it. But an escape is offered through the brilliant suggestion advanced independently by Fitzgerald and Lorentz that the motion of ether through matter may slightly alter its linear dimensions.

Coherers—In a paper read before the Physical Society, of Frankfort-on-the-Main, Herr Schafer described a "coherer" designed for use in connection with wireless telegraphy. The coherer is made by pasting strips of tinfoil on a glass plate. If the glass be silvered, it will answer the purpose equally well provided the silvering be divided into strips by a knife. A current of electricity across the metallic strips gives an electric resistance of 50, but when the electric waves impinged on them the resistance was increased a hundredfold. The coherer works in a vacuum.

Electrolytic Estimation of Bismuth—Hitherto it has been found impossible to obtain, by the electrolysis of bismuth salts, a sufficiently adhesive deposit to permit washing and weighing. Usually an amorphous deposit of oxide is obtained which is useless for quantitative work. A great variety of plans have been tried, but the only successful one appears to be that devised by D. Balachovsky, who states in a communication to the Academie des Sciences the following as the essential conditions of success: Feeble acidity of the solution; absence of chlorine, bromine, or iodine in any large quantities; feeble current, and unpolished electrodes. The best salt to operate upon is the sulphate or nitrate (but not the chloride), dissolved in nitric acid, to which is added about six times its weight of urea. The maximum current is 0.06 amperes, the voltage 1.5, and the temperature 60 degrees. The analysis takes about six hours or eight hours. Much care must be taken to prevent the current density unduly increasing, as then the deposit immediately begins to oxidize. After washing and drying the precipitate is very stable. Instead of urea, formic or ethylic aldehyde may be added to the electrolyte. The part played by these additions is not yet clear, but when aldehyde is used the temperature has to be a little higher, and the current density a little lower.

AMERICAN STREET RAILWAY ASSOCIATION.

PROGRAMME AND PARTICULARS OF THE NINETEENTH ANNUAL MEETING.

As previously announced in the ELECTRICAL REVIEW, the nineteenth annual meeting of the American Street Railway Association will be held at Convention Hall, Kansas City, Mo., on Tuesday, Wednesday, Thursday and Friday, October 16, 17, 18 and 19, 1900. Secretary Penington informs the ELECTRICAL REVIEW that papers will be read on the following subjects:

"Double Truck Cars; How to Equip Them to Obtain Maximum Efficiency Under Varying Conditions."

"Comparisons of the Various Systems of Electrical Distribution for Street Railways."

"Consolidations of Street Railways and Its Effect Upon the Public."

"The Store Room and Store Room Accounts."

"Painting, Repainting and Maintenance of Car Bodies."

It is expected that a large and attractive exhibition of street railway apparatus and supplies will be held. Friday, October 19, has been set apart as a day for the examination of exhibits. No session of the Association will be held on that day so that all the delegates and visitors may have ample time to view the exhibits. The annual banquet will be held at the Coates House, on Friday evening, when the officers-elect will be installed.

The headquarters of the association will be at the Midland Hotel, and special rates have been secured at this and other hotels for delegates and visitors. It is considered advisable for all those who desire rooms to apply at once.

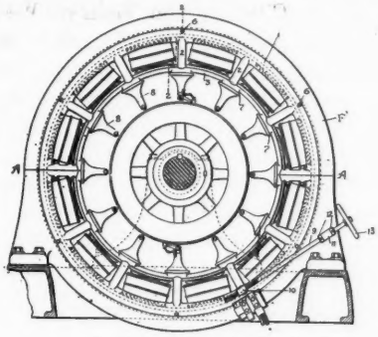
The passenger associations have granted a rate of one and one-third fare on the certificate plan for the round trip. The local committee in Kansas City has arranged numerous entertainments and it is expected that a profitable and enjoyable convention will result.

Expansion of the Western Electric Company.

The Western Electric Company has purchased 225,000 square feet of dock property at Chicago River and West Polk street, Chicago, at a price said to be in the vicinity of $625,000. It is expected that ultimately a large manufacturing building, devoted to heavy foundry and factory work and to the construction of cables, will be built upon the land at an additional cost of $1,000,000.

RECENT ELECTRICAL PATENTS

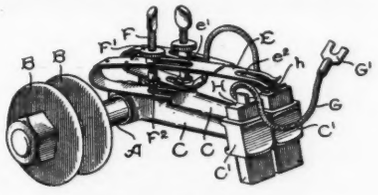
Henry G. Reist, of Schenectady, N. Y., assignor to the General Electric Company, of New York, N. Y., has obtained a patent on a brush holder ring. In multipolar dynamo electric machines it has hitherto been customary for the brush



BRUSH HOLDER RING.

holders to be carried on a ring arranged to slide in bearings formed in the free ends of a plurality of brackets, bolted or otherwise secured to the field magnet frame, and concentrically arranged around the armature shaft. This construction is somewhat cumbersome and unwieldy; and it is the object of the present invention to obviate these disadvantages and to secure an arrangement of parts which is simple, compact and easy of operation. In carrying out the invention the side of the field magnet frame is annularly recessed to receive a ring, and the recess is preferably of such depth that when the parts are in place the ring is flush with the outer surface of the field magnet frame. The ring thus forms part of the magnetic circuit and so economizes material. The ring carries a plurality of radial arms extending toward the armature shaft and outwardly from the plane of the ring and integral therewith, with a connecting ring integrally joining the inner ends of the arms for the purpose of stiffening the structure and rendering it more rigid. Brush holders are secured to the brush holding ring at suitable intervals and are insulated therefrom by plates of insulating material. Conductors connect the brushes of like polarity in multiple.

A patent has recently been granted on a brush holder to the General Electric Company, as assignee. It provides for such devices a convenient and efficient contact arm in which the brushes may be readily removed and renewed and in which the springs shall not carry such substantial portion of the current as to effect their resilience. At the same time the brush holder is readily taken apart and the brushes can be easily removed and quickly replaced without interrupting the running of the dynamo. Unlike most devices of the class described, the shank of the brush holder is solidly and substantially fixed on the stud. The entire movement of the device during operation is, therefore, in the spring and in the brush itself, which the spring holds down upon the commutator. It consists of a stud with the usual insulating septa, and clamped on said stud is one end of a solid shank of a brush holder having secured at its outer end a brush box. An approximately U-shaped spring, having one of its members longer than the other, is secured at the end of the short member to the solid shank by a screw. A nut mounted on the screw holds the spring in position and at the same time secures one end of a conductor; the other end of which is secured to a carbon brush loosely mounted in the carbon brush box. The screw is provided near its head with a second nut by which the tension of the spring may be adjusted and the free end of the long

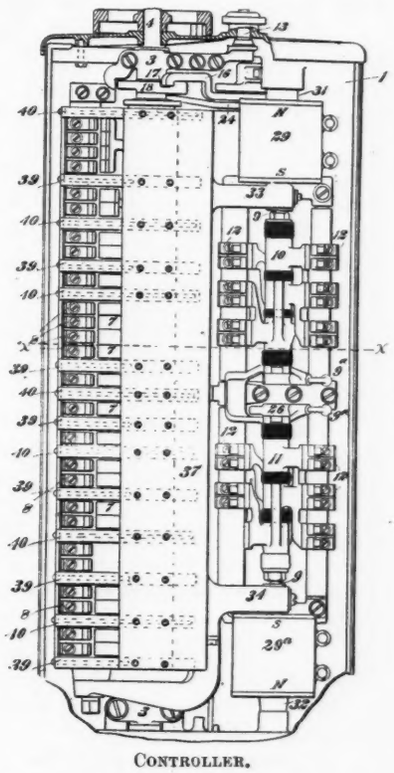


BRUSH HOLDER.

member of the spring presses on the carbon brushes. When it is desired to remove a brush the screw is turned and thus the nut holding one end of the conductor is turned also, releasing the said conductor; the spring is then removed from the top of the brush which may then be taken from the top of the brush box.

An apparatus employed for controlling electric motors, and having particular reference to such controllers as are employed in connection with motors utilized for propelling railway vehicles, has lately been patented by the Westinghouse Electric and Manufacturing Company, as assignee. The object of the invention is to provide a new and improved means for extinguishing the arcs which form between the stationary and movable contacts of a controller when the movable member is rotated to make circuit changes, vary resistance or open the circuit, such means being more effective in operation than anything of a similar character known as heretofore employed for these purposes. The invention consists of a drum and cooperating contact fingers, of one or more electromagnets having pole pieces extending longitudinally of the drum and arc shields projecting between adjacent fingers and provided with magnetic flux conductors which alternately project from points adjacent to the contact portions of the fingers to opposite pole pieces of the magnet or magnets, whereby the arc intercepting paths of the flux are longitudinal of the drum and the arcs are blown outward and away from the adjacent parts of the controller.

Speaking of the report that a new telegraph company was to be established in this country and of the difficulties in the way of such a project, Vice-President Clowry, of the Western Union, said yesterday: "I think it will cost about $15,000,000 to construct and equip a telegraph system to connect the large cities of the United States. I base this estimate on



CONTROLLER.

the cost of the systems built by the different companies which have from time to time entered the field. Seven companies organized to compete with the Western Union have failed of success, although they had but one competitor. A new company would have three competitors—the Western Union, the Postal and the Long-Distance Telephone. Telegraph construction is becoming more expensive every year. The service for the Government, for newspapers and for the public grows more exacting every year, and admits of no interruption or delay. If the Chicago Board of Trade enters directly or indirectly into a telegraph scheme it will encounter severe competition. We can not get to an agreement with the Board of Trade because its terms are such that they could not be accepted by any responsible telegraph company."

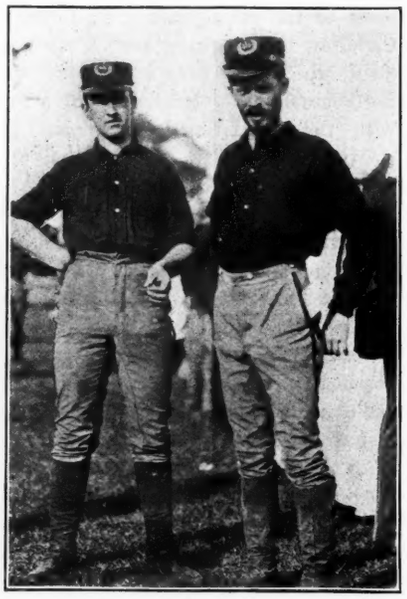
A Military Electrical Engineering Tournament.

The second annual military tournament and athletic games of the New York State and New Jersey National Guards and Naval Militia were held on the Horse Show Grounds at Hollywood Park, Long Branch, N. J., August 24 and 25. It will be remembered that at the military tournament, held at the Madison Square Garden last year, there was a pole-climbing contest between members of the various signal corps attached to the New York State National Guard. The military tournament at Long Branch this year was inter-state in character, and instead of being a team event, as was the former, was so arranged that individuals of the various volunteer bodies taking part were enabled to contest with one another for the prizes.

The object of the various contests has not, perhaps, been fully understood by the amateur soldiers who took part in them. It was desired on the part of the officers of the various corps to develop not only an *esprit du corps* but also to train the men—mostly gentlemen unused to severe and arduous manual labor—in the various arts and crafts necessary to be known by men in the field. In building military telegraph lines there is nothing more important that is necessary for the average private to know, and at the same time nothing that it is less likely that his previous training will teach him, than the simple art of climbing poles with spurs strapped to his feet, and stringing wires after he reaches the top. For this reason the pole-climbing contest has been of particular interest, and this year, at the Hollywood Park meeting, the first and second signal corps, National Guard, State of New York, participated with seven entries.

The contest was carried on in the usual way. A number of smooth-skinned poles were planted, and at the word the various participants, each of whom was provided with a number of rings, rushed to the poles and climbed up, hanging a ring to a spike in the top of each pole. They then descended, and running back to a fixed point again made for the pole and climbed it, hanging up another ring. A certain number of minutes was given for the contest, at the end of which the man who had succeeded in climbing his pole the oftenest and hanging up the most rings was declared the winner. Corporal M. C. Sullivan, First Signal Corps, was the winner of the event, and Corporal F. W. Smith, Second Signal Corps, was second. The accompanying illustration shows Corporals Sullivan and Smith as they appeared after the contest.

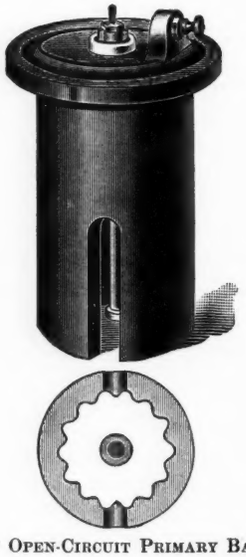
No little of the credit of making linemen and pole-climbers out of willing but utterly inexperienced men is due to the non-commissioned officers of these corps.



Corporal Smith. Corporal Sullivan.

CORPORALS SULLIVAN AND SMITH, FIRST AND SECOND PRIZE WINNERS IN THE MILITARY POLE-CLIMBING TOURNAMENT.

The object of the games is to interest the men—somewhat after the fashion of a kindergarten—in playing at the real work that they are to do. Corporal Sullivan has been very active in this matter, and while he has managed to win the prize this time he has also been enabled to instill into the undergraduates of his corps a good deal of active working knowledge which will be of immense importance to them should the country ever need their services in the field. Too much commendation can not be given to the enterprise which takes young men from the counting-room and the office and trains them in the hardy arts of peace as applied to war. It is gratifying to reflect that the signal corps of the New York State National Guard is undergoing a rough and ready training, and that its members will know how to climb poles, to string wire, to set up and operate telegraph and telephone instruments, and to make and break camp, cut their own fire-wood, wash their own dishes and clothes, and do all else of the innumerable duties that come within the province of a good soldier whenever the occasion arises.



A NEW OPEN-CIRCUIT PRIMARY BATTERY.

A New Open-Circuit Primary Battery.

The illustration herewith shows in perspective and in cross section the element of a new cell just brought out by the National Carbon Company, Cleveland, Ohio, which is claimed to possess extraordinary advantages.

The carbon element of the cell is essentially the same as in cylinder type carbons, but the walls of it are hollow and are filled with a depolarizing mixture. The ideal cell would be, of course, one that has the depolarizing element between the zinc and the carbon, a condition not fulfilled by the majority of cells containing a depolarizing element. While it may seem that in this cell this condition is not attained; still, an analysis of its action shows that when first put in circuit the interior walls of the carbon element become depolarized and are practically put out of service thereby. Action then takes place between the inner surface of the outer walls of the carbon and the zinc, bringing the depolarizing element directly into place.

In comparative tests made between this cell and ordinary cylinder cells, the first five minutes of discharge show the two keeping along well together, but after this the results are increasingly in favor of the new type of cell as the time of discharge grows longer. It is claimed by the makers that the most marked advantage of the new type is its quick recuperation. Everyone knows that a short circuit is liable to occur on the average bell or annunciator circuit, and that after this is removed the ordinary cell never recuperates to anywhere near its original value. It is claimed that the new cell quickly recuperates, the difference between it and the older types being claimed to be 90 per cent recuperation for the one and 26 per cent for the other.

A Submarine Arc Lamp.

Ever since the beginning of submarine work conducted by divers in searching wrecks, building piers, etc., there has been a continual demand for some variety of powerful light that would enable the diver to work assisted by the sense of sight and not, as is often the case now, entirely in the dark and guiding himself solely by feeling. In all but the clearest waters darkness practically reigns supreme below a depth of 30 or 40 feet. Incandescent lamps have been tried for submarine lighting, but have not shown sufficient illuminating power to meet all the demands of this kind of work.

At the time of the explosion of the Maine the inventors of the Yale submarine arc lamp began their investigations in the laboratories of Yale, which led

FIG. 2.—METHOD OF USING A SUBMARINE ARC LAMP.

ultimately to the construction of arc lamps of 2,000 candle-power for submarine lighting. Several other inventors attempted to accomplish this result but had failed. They had fed air to the lamp and removed the gases from the arc by means of rubber tubes leading to the surface. These tubes, together with the electric cable made the whole outfit too cumbersome and was discarded by divers and wrecking companies. The inventors of the lamp went about their investigations upon an entirely new principle, and as a result evolved a lamp, neat and light in its construction, that not only meets the requirements for submarine work but which is claimed to be far superior to any other source of light for this purpose.

No air tubes whatever are used, the feeding of oxygen to the arc being secured by a process known only to the inventors. The diving outfit consists besides the lamp, of a portable waterproof cable and of a switch for regulating and throwing the current on and off. The lamp itself consists of an upper mechanism chamber, containing solenoid and other mechanism. The lower chamber is enclosed by a glass globe which is hermetically sealed to the upper chamber by rubber gaskets. Inside the lower chamber is placed an inner globe and the carbons.

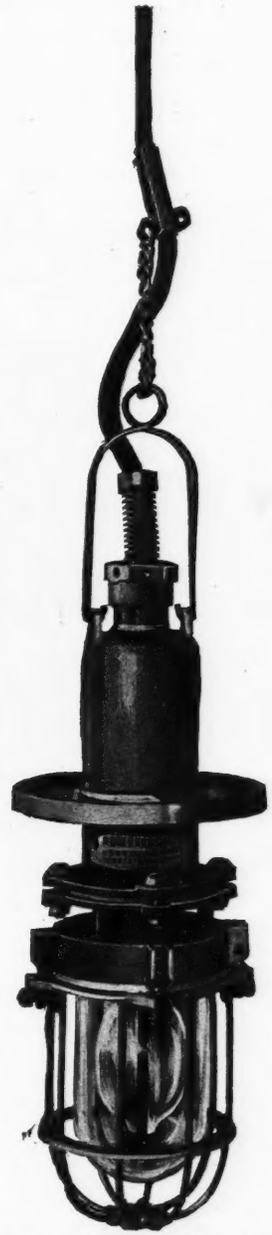


FIG. 1.—A SUBMARINE ARC LAMP.

The lamp is 22 inches over all, and is encircled by a handle nine inches in diameter. The metal parts are of gun metal. The glass globes are designed to withstand a pressure of 500 pounds, insuring safety at a depth of approximately 1,000 feet. The greatest depth to which any diver ever descended is reported to be 204 feet. The feeder cable is led into the mechanism chamber through a rubber-packed stuffing-box, and when immersed the lamp is absolutely water-tight.

The lamp is equipped with Holophane globes, especially made for submarine work, in order that the high diffusive quality of this variety of globe may be made use of to avoid the casting of sharp shadows by any part of the lamp frame-work or the cage surrounding it. The weight of the lamp under water is 12 pounds, enabling the diver easily to move it about at will, while its small and compact design enables it to be passed in through port-holes in a wreck or used in other confined spaces.

The same lamp is also suitable for use as a portable marine arc lamp in lighting ships, wharves, docks, bunkers, mines and other damp and gaseous places. Special precautions are taken to make the lamp safe for use in places where there are likely to be explosive gases present. The lamp is built for rough handling such as it is likely to get in the class of work in which it is to be engaged.

As used in the navy the lamp often saves dry-docking and serves for inspection and cleaning of sea-cocks, for the clearing of propellor blades, etc. The lamp will burn 10 to 20 hours on one set of carbons. To recarbon the lamp the globe is removed by loosening the thumb screws which hold the globe in place against the gaskets. The lamp may be used wherever there is an electric current either from the storage battery or from a dynamo. Experiments are soon to be made leading to the adoption of the lamp for service in pearl fishing, sponge fishing and submarine photography. However, the greatest field for the lamp is in shipyards, dockyards, navy yards, in the merchant marine and vessels of war.

The representative of the Russian Government, who made a special test of the lamp, recommends its adoption for use on ocean steamers, as an added precaution to the safety of crew and passengers. Any injury to the hold of the vessel may be as carefully examined and its magnitude as intelligently estimated by the diver with the aid of this lamp as would be the case in the open air.

Those most prominently engaged in submarine work are said to express the opinion that the lamp will revolutionize the whole art of submarine investigations. It is not known, except among the profession and those directly interested, that the decision as to the cause of the explosion of the Maine was taken from the testimony of the divers who had to trust entirely to the sense of touch. What an advantage it would have been and how much more reliable would have been the testimony of the divers if they had been able to avail themselves of the sense of sight as well as the sense of touch in this investigation.

The Naval Electric Company, 95 Liberty street, are the owners of the basic patents covering all forms of submarine lighting by means of arc lamps, and are manufacturing a large line of these lamps. The lamp is also patented in nearly every civilized country in the world by this company.

An Electric Engine-Stop and Speed-Limit for Large Steam Engines.

The invention described below is one that has been in use for some time and has proven of great value in many cases. It is intended to accomplish the stopping of a steam engine from one or several points, near or remote from the engine room, by pressing an electric button, or automatically, should the speed of the engine increase beyond the predetermined safe limit.

The action of the apparatus may easily be understood from reference to the illustrations herewith. Fig. 1 shows the automatic speed-limit device. This little piece of apparatus is belted, or otherwise connected, to the fly-wheel of the engine and may be set at will to any desired number of revolutions of the engine above the normal, operating only in case of increased speed above that point. Should the engine governor break, or the engine from any cause "run away," this machine instantly operates, closing a circuit through the engine-stop, which is shown in Fig. 2, and causing it to quickly shut the throttle valve of the engine to which it is geared by a sprocket chain. Reference to Fig. 3, which shows a large engine in the Brown & Sharpe Works, of Providence, R. I., equipped with the speed limit and stop, gives an excellent idea of the method of connecting the speed limit apparatus to the fly-wheel, and the stop to the throttle valve. It is claimed by the manufacturers, the Monarch Manufacturing Company, Waterbury, Ct., that, while the stop acts even more quickly than an engineer in handling the throttle, its power is so completely controlled by an air dash-pot, which acts as a cushion, that the valve can not be injured by being forced down too hard upon its seat.

FIG. 1.—AUTOMATIC SPEED-LIMIT FOR ELECTRIC ENGINE-STOP.

The stop may also be controlled by push-buttons placed at as many points as may be desired, so that, in case of the bursting of a steam pipe, the blowing out of a cylinder, or fire making it impossible for the engine man to get at the throttle valve, the simple pressing of the button anywhere about the works instantly stops the engine. Inasmuch as the stop is directly connected to the throttle the engine man is obliged to use it in closing the valve, this compulsory practice making it certain that the stop will always be in perfect working order in case of accident. In no way, however, does the machine take the control of the valve away from the engine man, allowing him to work it so as to prevent the engine stopping on a dead centre as is the usual custom. In connection with the system an electric gong is placed in the engine room notifying the engine man in case the apparatus acts. An automatic vacuum valve of simple construction, actuated by an electromagnet, is used in connection with the system for condensing engines in order to open communication between the condenser and the atmosphere, when the engine is stopped, to prevent the cylinder taking water when the throttle is closed and the steam pressure shut off. A peculiar application of the stop is made in the case of engines driving dynamos in multiple, where it is necessary to open the generator circuit simultaneously with the closing of the throttle. This is accomplished by a device which trips the circuit-breaker automatically as soon as the throttle-valve is closed by the stop.

The Monarch engine-stop has achieved a great degree of popularity in use, some 500 power plants being equipped with it. The three great plants of the Carnegie system, the Midvale Steel Company's plant, the great engine of the Boston Elevated Railroad Company, which is an 8,000 horse-power, vertical, Corliss engine, claiming to be the largest single steam engine ever constructed for use ashore, the Narragansett Electric Light Company, of Providence, R. I., and very many others are using the apparatus.

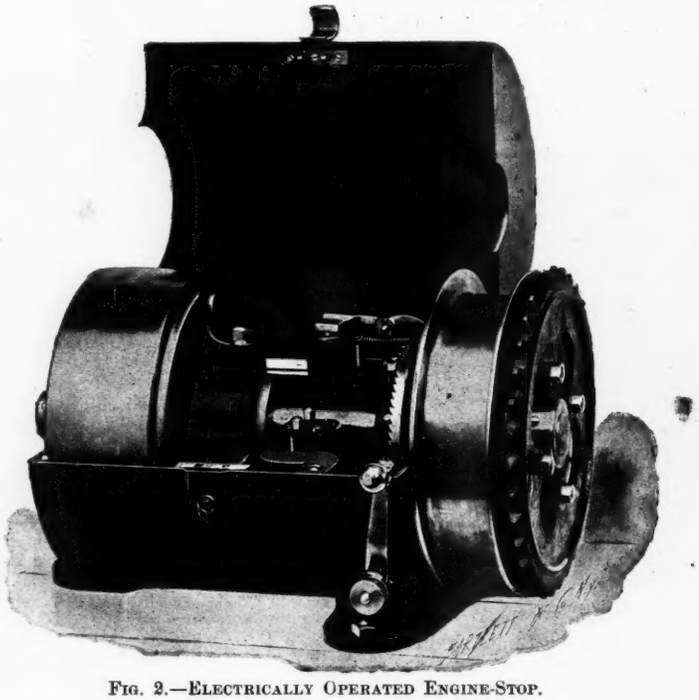


FIG. 2.—ELECTRICALLY OPERATED ENGINE-STOP.

Newport Automobile Races.

The automobile races to be held at Aquidneck Park, Newport, R. I., on September 6, at 2 o'clock P. M., have aroused considerable public interest. Newport society has taken up the automobile in earnest and the races will be one of the events of the season. A large number of entries has already been made, including Mr. W. K. Vanderbilt, Jr., who is expected to ride in his famous French racer, and who has also entered a steam carriage. Mr. Harold Vanderbilt has entered his three-wheel tricycle and other tricycles. Steam, gasoline and electric carriages will be driven by many others. The New England Electric Vehicle Transportation Company will also probably enter one of their racing machines. Handsome prizes have been offered, many of which are cups offered by W. K. Vanderbilt, Jr., Mrs. Herman Oelrichs, Mrs. O. H. P. Belmont and the New England Electric Vehicle Transportation Company.

ELECTRIC LIGHTING

A new power station will be constructed on the Little Androscoggin. The power site is owned by the Lewiston, Me., & Auburn Electric Light Company.

A new electric light and heating franchise has been granted by Bismark, N. D., to the Hughes Electric Company, which is putting in an improved plant. The franchise is for 25 years and is more complete and more definite than the old.

The navy department has been notified by the Westinghouse Company, contractors for the big electric power plant which is to be installed at the New York Navy Yard, that the machinery is ready for delivery. The entire power plant will represent an outlay of nearly $1,000,000.

A company is being formed to take over the Conroy electric plant at Deschenes, Quebec. It is proposed to issue $300,000 stock, of which $100,000 will be six per cent accumulative preference shares. Also to issue $100,000 of six per cent first mortgage bonds. The Conroys will be paid $200,000 in cash and $200,000 in common stock.

The Northern Light, Heat and Power Company is the name of a prospective competitor of Allegheny, Pa., electric companies. It has already been chartered and, it is said, will ask for a franchise at the next meeting of councils. Attorney James F. Burke is managing the legal end of the enterprise while ex-Mayor Geyer is said to be prominently identified with it.

The Manchester, N. H., Electric Company has purchased its two rivals, the Union and Merrimack Companies. The consideration, it is understood, is more than $1,000,000. The business of these companies will be consolidated, and with the new power at Garvin's Falls, it is expected to supply Manchester with the current needed for all purposes. The consolidated company now has at its disposal over 15,400 horse-power, electric and steam. It supplies power for the Manchester Street Railway, lights the streets and stores of the city; also lights the Manchester mills and furnishes all the power needed for commercial purposes.

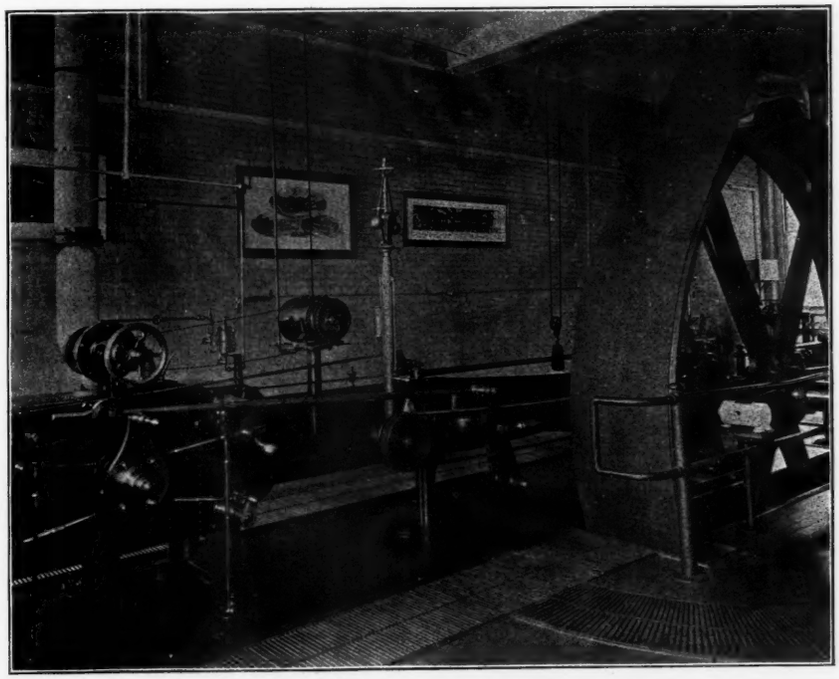


FIG. 3.—ENGINE EQUIPPED WITH AUTOMATIC ELECTRIC SPEED-LIMIT AND STOP.

Fort Wayne Electric Works to Be Enlarged.

Mr. J. J. Wood, general manager of the Fort Wayne Electric Works, Fort Wayne, Ind., announces that his company's plant will be considerably enlarged. It is expected that within three months a two-story building, 60 feet wide by 200 feet long, will be finished. It will be equipped with modern machinery for the manufacture of large dynamos, generators and motors for lighting and power transmission. When the contemplated changes are completed, employment will be given to more than 1,200 men. The improvements are expected to cost about $100,000.

AUTOMOBILES

The new steam motor wagon, capable of carrying four tons at five miles an hour, purchased by the Mersey Docks and Harbor Board, of Liverpool, England, for use in transferring material to and from the dockyard and among the various works, has, it is said, proved very convenient and economical, and has met the requirements very much better in all ways than ordinary carts drawn by horses.

Mr. Marcus Nathan, general manager of the Automobile Show, which will occur at the Grand Central Palace, New York city, from November 14 to 24, 1900, has issued a very attractive folder regarding the show. He makes the point that 50,000 visitors from out of town come every year to the New York Horse Show, and that all these persons are interested in automobiles. The fact that the Automobile Show and the Horse Show occur at the same time will make the former attractive to the Horse Show visitors.

Mr. M. R. Margerum, secretary of the Greater Inter-State Fair Association, of Trenton, N. J., has issued the following circular letter:

The Greater Inter-State Fair, of Trenton, N. J., to be held during the days of the 24th, 25th, 26th, 27th and 28th of September next, has opened an office in New York city, where information concerning the automobile department of the fair, exposition, as well as races, may be obtained. This department is under the direction of Mr. E. E. Schwarzkopf, Room 60, Astor Court Building, 25 West Thirty-third street, New York city.

Mr. George F. Chamberlin, acting president of the Automobile Club of America, has accepted, in behalf of his club, the cup which the Trenton Fair Association tendered the Automobile Club of America, to organize a road run from New York to Trenton, on September 22, the winner of the run to be presented with the cup. The Committee on Runs and Tours of the Automobile Club of America is now organizing the run.

It is contemplated that racing machines will give time allowance to the other automobiles entered in the run. To the programme of the automobile races, to take place September 24 on the half-mile track, has been added a motor-tricycle race of 10 miles, subject to the following conditions: First prize, $75 plate or cash; second prize, $25 cash; third prize, $5 cash. All prizes awarded if competed for by five or more participants.

If only three competitors, first prize only will be awarded.

All the floor space originally assigned to the automobile exposition department of the fair, comprising 25,000 square feet, has been taken, and the erection of an annex for the purpose is in contemplation.

The time originally set for the closing of entries for the automobile races has been extended to September 20.

COVINA, CAL.—The Covina Electric Company has been incorporated to generate electricity for light and power purposes. Principal place of business, Covina. Directors: T. B. Thomas, J. W. Calvert, O. Anderson, H. M. Houser, I. O. Houser, all of Covina. Capital stock, $25,000; subscribed, $500.

THE CANADIAN ELECTRICAL ASSOCIATION.

THE NEW OFFICERS.

The tenth annual convention of the Canadian Electrical Association opened in the City Hall Chambers, Kingston, on Wednesday, August 29, at 9 A. M., with Mr. A. A. Dion, of Ottawa, the president, in the chair. Addresses of welcome were delivered by the Mayor and Alderman Donnelly, and Mr. E. J. Pense, president of the Board of Trade. The president read his annual address.

The report of the secretary-treasurer was then presented, and showed that the membership of the association was steadily increasing. Reports of the committees on "Meter Inspection," "Statistics," "Legislation," and "Standardization of Accounts," were also presented. An afternoon session was held, and in the evening the delegates were tendered a complimentary searchlight excursion among the Thousand Islands. The principal business of Thursday was the reading and discussion of the following papers:

"Use of Dynamo and Storage Battery in Telegraph Offices." Mr. W. J. Camp, C. P. R. Telegraph Company, Montreal.

"Power Factor as Affecting Operation and Investment, with Special Reference to Induction Motors and Enclosed Arc Lamps." Mr. F. H. Leonard, Jr., Montreal.

"Conditions Affecting the Wave Form of Alternators." Professor L. A. Herdt, McGill University, Montreal.

"Rotary Converters." Mr. A. Gordon Grier and Mr. J. C. Hyde, Montreal.

"Railway Subject, Giving Several Curves Showing Up the Average Power During a Day, and Maximum and Minimum Requirements for Power Called for on the Quebec System." Mr. Blair, Quebec Railway and Lighting Company, Quebec.

On Thursday evening the annual banquet took place at the Hotel Frontenac, at which United States Consul Twitchell, Mayor Innes, Mr. Wm. H. Browne, of Montreal, and Mr. H. N. Folger, were the chief speakers. The election of officers took place on Friday morning, Mr. A. A. Dion, of Ottawa, being reelected president; Mr. E. E. Cary, of St. Catharines, first vice-president, and Mr. P. G. Gossler, of Montreal, second vice-president. It was decided to hold the next annual convention in the city of Ottawa.

Mr. Fred A. Larkin, New York manager for the Edward P. Allis Company, Milwaukee, Wis., returned to New York city last Saturday, after a six weeks' trip to Europe.

Electric Light Station Boiler Explosion.

The explosion of a boiler on September 3 wrecked the plant of the New York Light and Heat Company, at Biddeford, Me., killed one man instantly and fatally injured another. The property loss is about $6,000. The company had done all the street and commercial lighting in Biddeford and Saco, Me., and also ran a Summer circuit to Old Orchard, Me. Last Fall the company's Saco plant was demolished by a boiler explosion, and since then the Biddeford station has been carrying the entire load.

Another Clambake.

Invitations have been issued for the twenty-second annual Rhode Island clam dinner tendered to the electrical fraternity by Mr. Eugene F. Phillips, general manager of the American Electrical Works, Providence, R. I. The function will occur at the Pomham Club, near Providence, on Thursday, September 13. Luncheon will be served at 11.30 A. M., and the clams will begin to pop at two o'clock in the afternoon. The usual games and other forms of jollification will occur, and it is expected that Mr. Phillips's hospitality will be enjoyed by an unusually large number of electrical men.

The Incandescent Lamp Field.

There are about a half dozen manufacturers of incandescent lamps who are not in the agreement on prices, which was entered into a few years ago by a number of the leading manufacturers. Among these companies are the Shelby Company, of Shelby, Ohio; Fostoria Lamp Company, of Fostoria, Ohio; Warren Electric and Specialty Company, of Warren, Ohio; General Incandescent Lamp Company, of Cleveland, Ohio, and the manufacturers of the Munger lamp, at Springfield, Mass.

It is now announced that the companies outside the fold, so to speak, have prospered, and at times have been a thorn in the flesh of the allied manufacturers. Recently, it is understood, efforts looking towards bringing the outside manufacturers into the fold have been made. Several meetings have been held by the representatives of the companies named above, the first in Cleveland, two or three weeks ago, again in New York, last week, and another meeting is expected to be held in Cleveland, on Saturday of this week.

It is doubted by parties well informed on the lamp situation if the agreement can be made, but the Cleveland meeting this week will probably bring the matter to a head. It is stated that the outside companies insist on the right to sell lamps at a figure slightly beneath the quotations of the other companies.

Wall Street and the Electrical Stock Market.

Stagnation was the chief characteristic of the stock market during the week. At the close to-day there were heavy transactions in a few stocks, among which was Brooklyn Rapid Transit. This gave an appearance of animation to the market as a whole for the day, which, however, was not borne out in the dealings of the general list. The exchanges closed to-day to resume business on September 4.

On the New York Stock Exchange, General Electric closed the week at 138 bid and 139⅛ asked, a gain of ⅝ of a point for the week. Metropolitan Street Railway, of New York, closed at 153¾ bid and 154¼ asked, a gain of ¼ point for the week. Third Avenue Railroad closed at 110 bid and 112 asked, a gain of 1 point for the week. Brooklyn Rapid Transit closed at 55⅛ bid and 55¼ asked, a gain of 1⅞ points for the week. Manhattan Street Railway, of New York, closed at 91⅝ bid and 92 asked, indicating no change for the week. On the Boston exchange the telephone stocks were not quoted.

On the Philadelphia exchange, Electric Storage Battery, common, closed at 70 bid and no asked price. Union Traction closed at 36⅝ bid and 36⅞ asked, a loss of ⅛ point for the week.

On the curb, or outside market, in New York, Electric Vehicle closed at 15 bid and 20 asked, a gain of 1 point for the week. Electric Boat closed at 13 bid and 17 asked, a gain of 1 point for the week.

Wall Street, August 31.

Electrical Manufacturers Combine.

The Cutler-Hammer Manufacturing Company, of Milwaukee, Wis., announces that it has purchased the plant, patents and property of the Iron-Clad Resistance Company, of Westfield, N. J., and has retained the latter company's engineering force. The business will hereafter be carried on in the name of the Cutler-Hammer Manufacturing Company, and both the Westfield and Milwaukee factories will be operated with increased facilities. Rheostats of all types will be manufactured, especially with either the open or enclosed type of resistance.

It is stated that work will be begun in September on the new telephone system of Sedalia, Mo., for which Colonel Churchill and Mr. Chaddock, of St. Louis, obtained a franchise several months ago. The work will be begun in the early part of September, and they say they will have the system in working order before Winter.

WHY YOUNG MEN SHOULD NOT GO TO COLLEGE.*

BY COLLIS P. HUNTINGTON.

I regret one tendency in our country, admirable as her institutions are. It is almost heresy to say it, but I do not mind taking the responsibility, for that is one of the things I am used to. I refer to the increase of higher education for the masses. The Anglo-Saxon has easily outstripped all his competitors in those things which make for the commercial growth and success of nations, because he has been, above all others, practical. While the preparation for professional life requires advanced knowledge, it seems to me that the vast majority of our young people spend too many of their vigorous years inside the schoolroom and not enough in the practical work of life. The years from 15 to 21 are especially valuable, for they are years of keen observation, individuality and confidence. In many cases—quite too many—they are spent in cramming the mind with knowledge that is not likely to help a young man in the work he is best fitted to do. How many young men with college educations are standing about waiting for something that will never come, because the work that lies nearest at hand is not to their liking? Somehow or other, our schools which teach young people how to talk do not teach them how to live. People need little, but want much. Since I first went to California, one-third of my mail has been made up of appeals for help, and these calls are equally divided between requests for contributions to help pay off debts and mortgages which should not have been contracted, applications of young men out of work, who always have my sympathy, and cries for succor from the sick and suffering poor, who must be cared for whatever may be the cause of their sickness or their poverty—and the poor we have always with us. The sons of farmers are forsaking the fields because the cities are more attractive to them. It seems to me that slowly, but surely, there is growing up a stronger and stronger wall of caste with good honest labor on one side and frivolous gentility on the other. We seem to be fast outgrowing those things which, when our fathers lived, were called "sterling qualities," but now are called follies, or "work that a gentleman should not do," as if all honest work were not honorable work.

It would be one of the most unfortunate things in the world if the present generation of young people should widen that wall or build it higher, for so to do would be to render a return to old fashioned principles more difficult. Americans have become what they are by sticking to the right side of that line of demarcation.

*From *Success*

The Hoepfner Electrolytic Process.

A plant to work the Hoepfner wet process for the extraction of copper has been erected at Papenburg, Germany, says the *Engineering and Mining Journal.* It has a capacity, it is stated, of a metric ton of refined copper daily. The ore is first crushed in Grusonwerke ball mills and leached with cupric chloride solutions. The solution dissolves copper, lead, nickel and silver, the cupric salt being reduced to the cuprous state. After purification and being freed from silver, the solution is allowed to flow to a compartment with carbon anodes and copper cathodes. Chlorine is liberated at the anodes regenerating the cupric solution, which is returned to a fresh charge of ore. It is claimed that 91 per cent of the contained copper was obtained after four hours' treatment of Rio Tinto ore containing 3.37 per cent copper and only three per cent of the iron content dissolved. By longer contact 98.5 per cent of the copper was extracted with only four per cent of the iron taken up. It is claimed, moreover, that one horsepower in 24 hours will produce 54 kilogrammes of copper as against 15 kilogrammes by the sulphate process.

NEW OFFICES OF THE "ELECTRICAL REVIEW," PARK ROW BUILDING, NEW YORK.

New Offices of the "Electrical Review."

During the last year the electrical field has made large strides and has been conspicuously busy, even among the host of industries that have acknowledged prosperity during the present good times. The ELECTRICAL REVIEW has endeavored, with what success its readers best know, to keep pace with the extension of the field, and to reflect, as faithfully as might be, the progress of the electric arts. It has not, however, neglected its opportunity to share in the general expansion of industry and business which is found on every side in electrical work. For this reason it has rapidly outgrown its present office room in the Times Building. Increases in the staff and in the amount of matter published in each issue have compelled the removal of the publication and editorial offices to some less confined space, where there will not only be room for present work but an opportunity for further expansion that is confidently expected. Unable to find, in the building in which it is at present located, offices of the desired size and location, attention has naturally been turned to the old quarters of the ELECTRICAL REVIEW, at 13 Park Row, where for 10 years this journal was published and where it began to grow into the position which it now occupies.

Upon the site of its old offices at that number there has been erected the magnificent modern office-building shown in the accompanying illustration. This building is the most complete and best equipped office-building in the world, and enjoys the further distinction of being the highest building in the world used for business purposes. It is interesting to remember that it has 31 floors of offices, that it is 380 feet high, that 900 horse-power are required to maintain the power service for its 7,500 electric lights and 10 electric elevators, and that it is located in the very centre of activity of the busiest city in the world.

In this fine building, in a large suite of offices, all fronting on Park Row, on the level of the tenth floor, where the balconies are shown in the illustration, the ELECTRICAL REVIEW has made its new home. The new offices will be furnished with intercommunicating telephone systems and an exchange connecting with the city system, and with all other conveniences necessary for the conduct of the editorial and publication offices. It is expected that the new suite will be occupied about September 10, and the issue of the ELECTRICAL REVIEW for September 12 will be published from the new offices. In that issue will be inaugurated certain changes long under contemplation in the typographical appearance and the make-up of the paper, which it is felt will commend themselves to its readers and friends.

TELEPHONE AND TELEGRAPH

The farmers of Weld County, Colo., are determined to have a telephone system of their own. Some of the line of wire may be made up with the good-natured barbed wire on the fences, but as long as it conveys sound properly it makes no difference.

The plant of the Maryland Telephone Manufacturing Company, of Baltimore, which was destroyed by fire August 22, will be rebuilt at once.

The all-Canadian telegraph line to Dawson, and the extension to meet the United States Government Signal Service line at Fort Cudahy, will be completed on September 1. J. B. Charleson, superintendent of construction, states that on that date he will accept a telegram from New York for Dawson overland by way of Ashcroft, B. C.

The Southern Indiana Telephone Company, an organization of independent companies has been organized with the following officers: G. A. Kienley, of Huntingburg, president; C. D. Knoefel, New Albany, vice-president; Ernest Pickhardt, Huntingburg, secretary; Samuel Doane, Jasper, treasurer. The object of the organization is to establish a long-distance system.

It is expected that the Northeastern Pennsylvania Telephone Company will have its line completed to Uniondale within three weeks. A branch line will be built to Sherman, Wayne County, and Deposit, N. Y. It is an isolated farmer who will not have a telephone wire singing over his farm. He can sit down in his home and talk with New York and Chicago, at so much per.

It is more than possible that a new telephone system will be inaugurated in Batavia, N. Y., in the near future in opposition to the Bell Telephone Company. James A. Nolan, of Buffalo, a representative of the Rawson Company, of Elyria, Ohio, has made application to the board of aldermen for a franchise to erect poles and wires on the streets and install a system, the work to be completed within a year. The charge per telephone would not exceed $36 a year in business places and $18 in dwellings. The matter was referred to a committee to report.

Telephonic communication from the staterooms of ocean-going steamships when at their docks at New York is to be furnished by the New York & New Jersey Telephone Company. A central switchboard will be provided on board the vessel, from which a multiple conductor cable will pass to the deck. The end of this will be provided with a coupling to fit a similar one attached to a cable on shore. The latter will lead to one of the city exchanges. By this arrangement it will be possible for passengers to telephone from on board the steamer to any point on the local or long-distance lines as soon as the vessel reaches the dock.

The Greeley Independent Telephone Company has been incorporated in the office of the Secretary of State, of Colorado, with a capital stock of $10,000. A. W. Trenholm, Bruce F. Johnson, J. E. Neill, George J. Speer and Fred E. Smith are the incorporators of the new company and represent the best business men of the county. From the articles of incorporation it is evident that the new company intends to cover the entire field in northern Colorado and is empowered to obtain letters patent on any device it may have for transmitting sound. Berthoud, Loveland and other towns are mentioned where connections will be made at once and the company asks the right to operate anywhere within the state of Colorado.

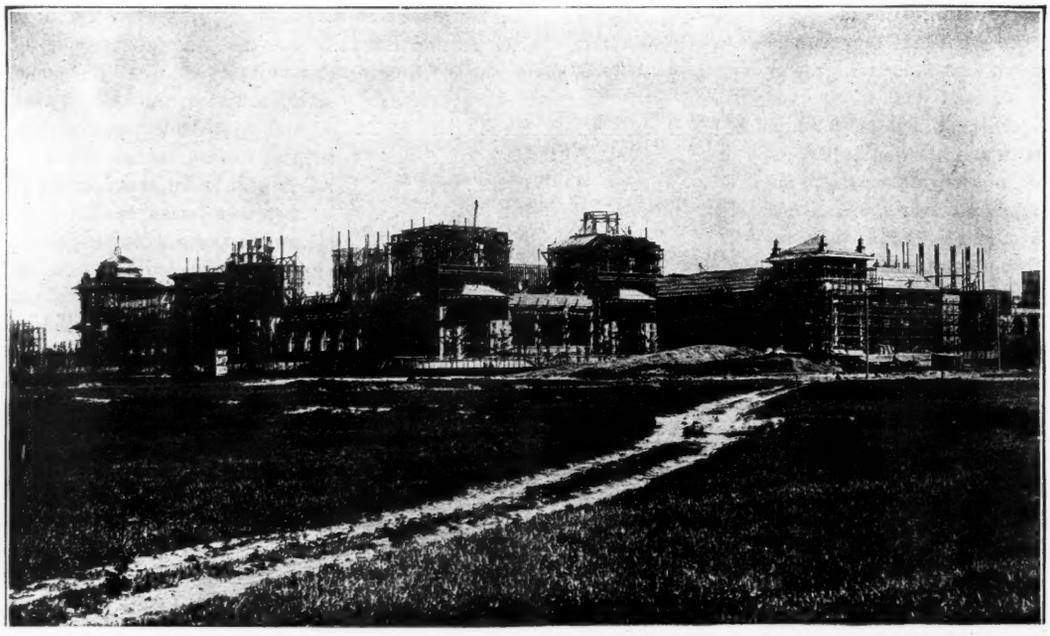


FIG. 1.—PROGRESS OF WORK ON THE ELECTRICITY AND MACHINERY BUILDINGS OF THE PAN-AMERICAN EXPOSITION, BUFFALO, N. Y.

Some misunderstanding has arisen with respect to the recent sale of American Telephone Company bonds to the Kidder, Peabody & Company syndicate, as to the amount of bonds now outstanding. In the early part of January last the American Telephone and Telegraph Company made arrangements with Kidder, Peabody & Company for financing the needs of the company for the year 1900 to the extent of $10,000,000; the arrangement was partly firm and partly on options. Of the above $10,000,000 bonds it is said the syndicate at that time purchased $6,000,000, the options on the remaining $4,000,000 not having been exercised. The present arrangements are that the syndicate now takes these $4,000,000 bonds, and has options on $5,000,000 more, so that if the present options are exercised the total outstanding American Telephone and Telegraph bonds will be $15,000,000 and not $20,000,000, as generally supposed.

Progress of Work on the Pan-American Exposition, Buffalo, N. Y.

The accompanying views give some idea of the progress of work upon the buildings for the Pan-American Exposition, to be held in Buffalo next year. One of these shows the Electricity and Machinery buildings, looking southeast from that portion of the grounds which will be occupied by the Midway. The view does not clearly distinguish between the two buildings, but they are in reality separated by one of the main thoroughfares of the exposition, known as the Mall, 150 feet wide, which runs east and west. The other shows a nearer view of the Electricity Building, looking up at the southeast corner. The point of view is near the base of the Electric Tower, the first lengths of the steel frame work of which are now being put in place and which will ultimately reach skyward 375 feet.

All of the large buildings of the exposition are well under way. These include, besides those here represented, the Agricultural Building, Manufacturers and Liberal Arts Building, Graphic Arts, Forestry and Mines, Horticulture, the large group of three Government buildings, Temple of Music, Ethnology Building, Stadium, Midway entrances and concession buildings, New York State Building and the Albright Gallery of Art. The Service Building, which is the administrative headquarters of the exposition, was completed early last Fall.

By reference to the illustrations here given it will be seen that workmen are already putting on the white staff with which all the buildings are to be covered. The staff is prepared in an endless variety of forms, including elaborate statuary, large cartouches and medallions, rich columns, consoles and brackets, soffits and pilasters in relief, and all sorts of architectural ornaments of intricate detail. All the exteriors of the buildings are to be finished in color, presenting a most agreeable effect upon the eye. It is said of this exposition that it will surpass all former expositions in the extent and variety of its sculpture and plastic decoration. It will also outrival its predecessors in the beauty and completeness of its horticultural and floral effects, and is to have the most elaborate and picturesque presentation of electrical effects ever undertaken. The arrangement of the buildings is a symmetrical one, nearly all of the principal structures being grouped about broad courts. About 33 acres of land are comprised in these courts, all of which will receive this elaborate embellishment. Large pools with a bewildering number of fountains and jets of water will complete the picture, and at night the rippling surfaces of water will be made particularly brilliant by means of floating lights and the wonderful illumination of all surrounding objects by the use of more than 200,000 electric lamps.

The installation of the heavier exhibits is to begin early in November and the contracts require that all of the principal buildings shall be completed before severe weather sets in. Thus is the public assured that the exposition will be opened on time, and that the early comer will have quite as much to see as those who delay their visit.

The process of building a great exposition has a charm to every one who has an interest in the development of any grand enterprise. It represents a vast organization, with its director-general and assistant directors, superintendents, contractors, caretakers, foremen and an army of workmen under the discipline necessary to carry on rapidly and successfully a great work. Materials are being brought into the grounds by train loads almost every day, and each week shows definite progress. The illustrations here given show what has been accomplished on the buildings in about three months. Another three months will find several of them completed and all of them so well progressed that the rigorous weather of Winter can not interfere with their prompt completion.

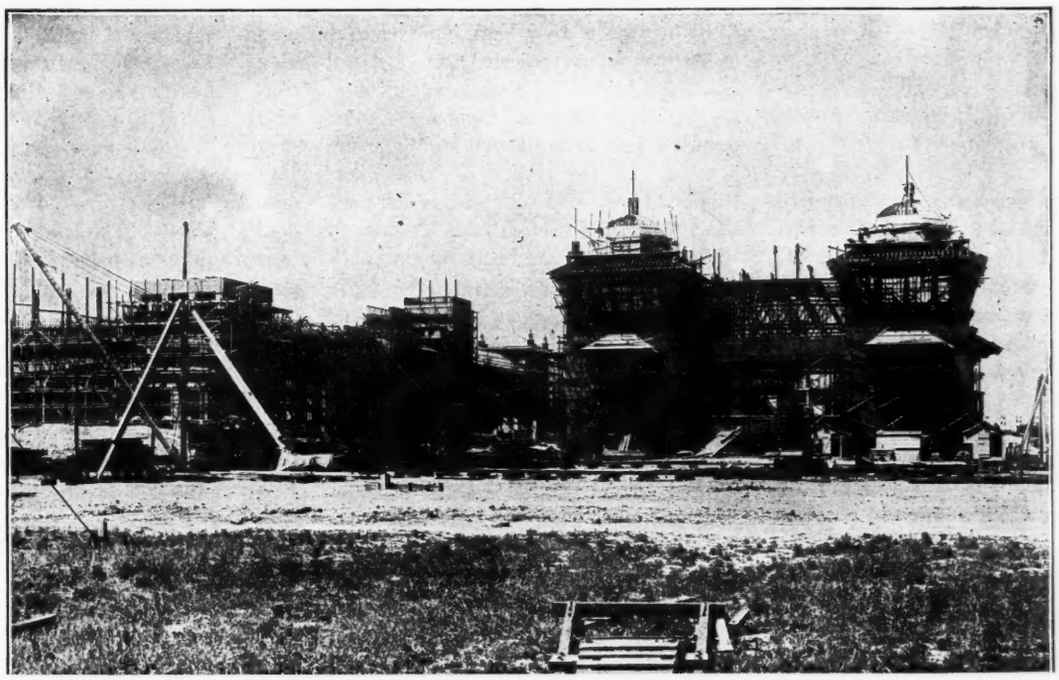


FIG. 2.—THE SOUTHEASTERN CORNER OF THE ELECTRICITY BUILDING OF THE PAN-AMERICAN EXPOSITION, BUFFALO, N. Y.

Agreements for the formation of the Exchange Telegraph Company, with which the Chicago Board of Trade will displace the Western Union and Postal companies in the distribution of market quotations among outside exchanges, have been drawn up and are ready to be submitted to the exchanges that will become shareholders. The Board of Trade committee met and practically decided to go ahead with the formation of the new company. As projected the Exchange Telegraph Company will extend its lines from Chicago to 27 cities.

ELECTRIC RAILWAYS

The United Traction Company, Pittsburgh, has been sold to M. K. McMullin for $4,500,000 cash.

"Tuppenny Tube" is the name given by the Londoners to the new underground railroad which seems to be very popular.

The Atlanta, Ga., Railway and Power Company has filed a mortgage of $6,000,000 covering its property. It is a consummation of a plan to consolidate the street railway interests of Atlanta.

The Lancaster, Pa., Mechanicsburg & New Holland Electric Railroad Company has leased for 999 years the New Holland Turnpike Company, 13 miles in length. A trolley road will be built on the turnpike.

No less than 84,500 passengers were carried by the Central London Underground Electric Railway on the opening day, while this total was substantially increased on the day following, when 90,000 people traveled.

The Supreme Court of Washington has rendered a decision favorable to the Seattle Electric Company in its franchise case, reversing the decision of the lower court. This gives the company a complete railroad franchise for 35 years on all its present lines as well as on several new ones.

There is no longer any doubt about the construction of the interurban electric line between Denison and Sherman, Tex. The money needed is in readiness, contracts for the equipment, boilers, generators, rails, ties, poles, etc., have been let, and it is expected that the contract for grading will be let immediately.

The directors of the Bristol, Ct., & Plainville Tramway Company have voted to extend their line to Terryville provided that the town of Plymouth will eliminate the grade crossing at Terryville station, and provided further, that the towns of Plymouth and Bristol do not impose any conditions that are practically prohibitive on the company.

An electric railroad from Bloomington, Ill., by way of Martinsville is projected by Chicago capitalists, who have secured the right of way the greater part of the distance between Bloomington and the Monroe-Morgan County line. The people along the proposed new road are delighted over the prospect of getting a direct route to Indianapolis.

The Coffenberry-Bishop syndicate, of Cleveland, Ohio, has purchased two electric street railway lines in Fort Worth, Tex., the City Street Railway, and the Fort Worth Street Railway, for approximately $400,000. The syndicate's Fort Worth lines and its lines in Dallas will be connected by 32 miles of road to be built between the two cities at a cost of $1,000,000.

The Northern Ohio Electric Company, which is to build a trolley line from Wheeling to Wellsburg, W. Va., has organized permanently. Howard Hazlett was elected president; John G. Welty, vice-president, and John Arbenz, secretary and treasurer. The company has already secured the right of way, and has ample financial backing. The road will be 15 miles in length.

The Amsterdam, N. Y., Street Railway Company has secured a right of way for its proposed extension to Rockton, and will make application to the Common Council of Amsterdam for a franchise to operate its line from the end of the Market hill branch, through Meadow street, for a distance of 150 feet. It is expected that the road will be built to Hagaman this year.

The reported trolley line being planned from Trenton to New York is understood to be part of a projected long-distance line from Boston to Washington, promoted by J. F. Shaw & Company. The proposed line from Boston to Worcester is a part of the system to New York. Rights of way and toll bridges have already been fully secured from Trenton to Philadelphia, and are being sought south of that city.

The United Traction Company and the Schenectady Railway officials have come to an understanding regarding the proposed line from Schenectady to Albany. By the agreement entered into the Schenectady company will build a line from Schenectady to Albany over the Schenectady turnpike. The road also will have the right to run its cars to the heart of Albany over the United Traction Company's tracks.

The work of grading the extension of the Westbrook, Me., Windham & Naples Electric Road will commence September 1. The line will be extended the coming year from Windham to White's bridge, which is near the outlet of Sebago Lake and about 10 miles beyond the present terminus at Windham Centre. When this is completed more than half of the proposed line, which will be 26 miles, will be laid and travelers will have a ride of 20 miles from Portland to White's bridge through a very pleasant country. The people along the route will assist in the work of grading.

The management of the Massachusetts Electric Companies has been very well satisfied with the business of the present Summer, the aggregate earnings of the properties having shown up well as compared with last year. Oddly enough on the exceptionally hot days of the season the traffic has not been so heavy as when the thermometer has been down around 80. This is accounted for by the unwillingness of people to leave home on extremely hot days.

A charter has been issued to the Fairmont, W. Va., & Clarksburg Electric Railway Company, with the principal office of the company in Parkersburg. The railway which this company proposes to construct and operate will commence at or near the town of Fairmont and run thence by the most practicable route to Clarksburg. The incorporators are Johnson N. Camden, Sprigg W. Camden and Isaac D. Davis, of Parkersburg, W. Va.; Herbert R. Preston, of Baltimore, Md., and James A. Fickinger, of Monongahela, W. Va.

The Toledo, Ohio, Fremont & Norwalk Electric Railway Company has secured a private right of way alongside the Lake Shore & Wheeling & Lake Erie tracks from the west line of Montroeville to where its line crosses the Bellevue and Monroeville road, just east of Bellevue. This right of way is 33 feet wide, and was secured at a cost of $100 an acre, or a total of $2,540. The land was purchased from 15 different parties. This action is proof that the road will not be built through Montroeville, but that it will pass south of the Lake Shore depot, and strike the Norwalk road at Tom Covis.

It is said that the terms of the merger of the trolley interests of Senator John Kean with those of the Hine-Riker syndicate of New Jersey trolley roads, have been settled and that the consolidation will take place on December 1. Between now and then Senator Kean will complete his line as far as Cranford. After the merger is effected the syndicate will extend the line to Cranford out to Springfield, and thence westward into Morris County, tapping various villages and eventually reaching Morristown, and possibly even Dover. What the division of the combined stock will be is not known.

The Terre Haute, Ind., & Wabash Valley Railroad Company has filed articles of incorporation, with $300,000 capital stock. This is the company that proposes to build a trolley line to points south and southwest of Terre Haute, touching

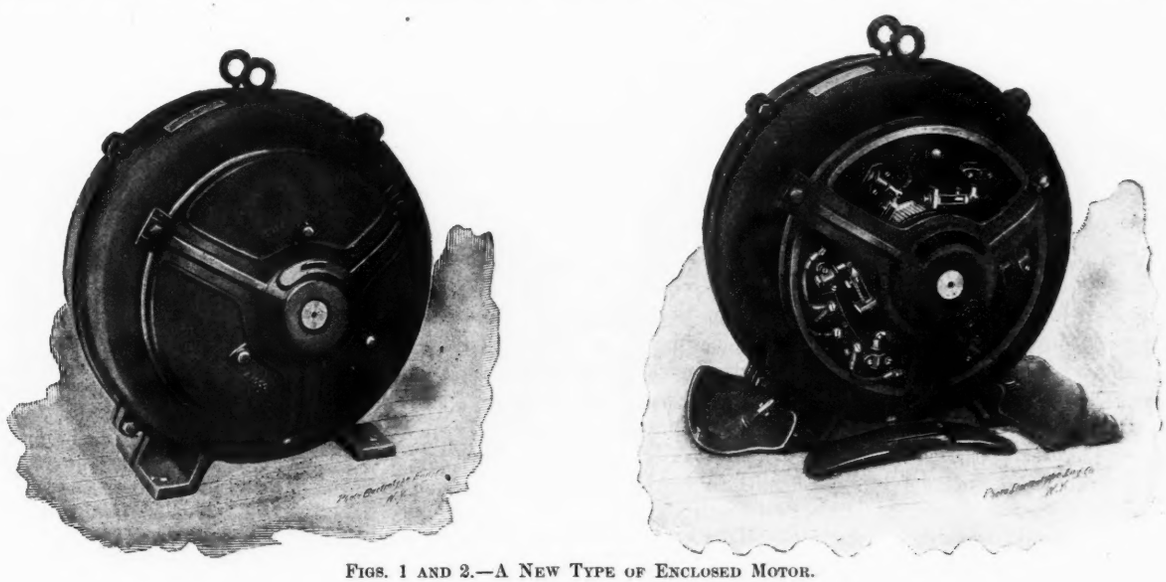
the Wabash River at Merom, Sullivan County. The following are the directors: B. G. Hudnut, Gus Conzmann, Fred Smith, A. M. Higgins, J. R. Kendall, John Beggs and M. C. Hamill. Mr. Kendall is president of the company. He was formerly connected with the Vandalia at this point but in the past few years has been putting in gas plants in New England. Most of the capital for the new road will be obtained in Boston. The company has a franchise from the county commissioners for the use of some of the roads running south from Terre Haute, but it is announced that one line will be through private property, keeping close to the Wabash River. It is the hope to have the line in operation early in next year.

The Dayton, Springfield & Urbana Electric Railway Company has its line in operation between Dayton and Springfield, Ohio, and is pushing the work of grading and tracklaying between Springfield and Urbana. The length of line in operation is 25 miles, and the Urbana extension will add 15 miles more. The construction work is exceptionally fine, and the travel heavy over the completed portion of the road. The promoters of this road are also interested in the Columbus, London & Springfield Electric Railway, and they will probably be consolidated in the future. Work on the latter road has been started at Columbus as well as Springfield, and it is thought that the road can be finished between these two cities within a year, the distance being 45 miles. This will make a continuous traction line between Columbus and Cincinnati, *via* London, Springfield, Dayton, Middletown, Hamilton, etc., covering a total distance of 125 miles, and practically paralleling the Big Four system between the points named. It is also thought that the Urbana line will soon be pushed on towards the lake, with a terminal at Sandusky or Toledo, possibly both places.

If the present plans of the trolley magnates go through, Meriden, Ct., will become the centre of a great web of trolley lines. The Meriden, Southington & Compounce Tramway Company will, it is understood, at the next session of the legislature, ask for an amendment to its charter, granting that company to extend its lines to Cheshire and to Waterbury. With the advent of the proposed line from Middletown and that of Wallingford and the proposed Southington road extensions, Meriden will have become the business centre for a great outside country. The Southington road received an offer from the Connecticut Lighting and Power Company over a year ago, but that offer was refused and it is understood to be the purpose of the present owners to retain the property, which has, it is understood, been well managed and is a well-paying institution. The company will ask the next legislature to renew its charter right, giving it the privilege of extending its line to Cheshire. Not only that, but if an agreement could not be made with the Fair Haven & Westville road to extend its lines from Mt. Carmel to Cheshire to connect with the Southington branch, the latter company would do so, and thus form a complete trolley line from New Haven to Hartford, or rather from Bridgeport to Hartford.

A New Type of Enclosed Motor.

The accompanying illustrations show a new type of enclosed motor recently put on the market by the Sprague Electric Company, of New York. At the factory it is known as the "SS," or slow speed, motor, and is the same as the medium speed (MS) except that it has brackets fastened to the field frame instead of being supported by pedestals attached to a subbase. This motor is electrically identical with the company's well-known line of pedestal motors and is intended to furnish a line of motors that will have the same horse-power outputs, speed and characteristics as the "MS" type. It is adapted to universal use either as an open or as an enclosed dustproof motor, and can be attached to the ceiling, wall or floor. It has automatic oil wells and ring bearings and removable covers. It can be made with one or two oil ring bearings, but the single oil ring bearing is used only where the space is limited as it makes a very narrow machine. It can also be provided with sliding rails which, combined with baseplate make a very neat and substantial arrangement. The enclosure doors are so designed that when removed the motor is complete and has no knobs or projections that are unsightly. The brushes are mounted on a rocker-arm which is adjustable and can be provided with a hand wheel, if desired, when used as an open type. The range of the motors runs from one-half to 50 horse-power, and from 150 to 1,000 revolutions per minute. They are made in all standard voltages and can be used for direct connection, gear or belt-driving.



FIGS. 1 AND 2.—A NEW TYPE OF ENCLOSED MOTOR.

The Commercial Cable Company announces that 1,057 miles of the new German cable have been laid.

Some Early Automobile History.

[From the American Machinist.]

It is quite the fashion in these days, especially in the American press, technical or secular, when discoursing upon mechanical and engineering topics, to indulge in continuous self-gratulation over what we have done and what we are doing. As the story goes we are all the while astonishing ourselves and all the world at the rate of our progress and the individual developments which mark it. Much of this, no doubt, is warranted, but there is still room for question whether the advance has been what should have been expected all along the line. We are unable to repress the conviction that we are in some lines far behind where we should have been in the natural course of events, as that course was indicated more than half a century ago. The special field of development which we have at present in mind is that of the mechanical propulsion of vehicles, both freight and passenger, over our public roads. We take the liberty of going back something more than the half a century just alluded to, say 70 years, or, to be exact, to the year 1831, and calling attention to what was being done at that time. We need not call attention to the fact that those were the days of the infancy of the steam engine, and that the other means of power development and transmission which have since developed so magnificently were then unborn and undreamed of.

It is a rather curious circumstance that in commenting upon the status in 1831 of the self-propelling vehicle upon common roads we find the dignified *Edinburgh Review* indulging in the same strain of disappointment and reproach which we to-day feel impelled to give words to. It says, October, 1832:

"When it is considered that several years have now elapsed since the practicability of propelling a carriage on a common road was established by incontestable experiment, it will naturally be inquired, why in a nation celebrated over the world for its mechanical skill and commercial enterprise, and abounding in capital, the project has not yet attained a more advanced stage?" This, written 68 years ago, could be written and fully justified to-day. That there was full warrant for it even then is evident from the simple statement of facts which is given:

"It appears that after several years of indefatigable exertion, during which he (Goldsworthy Gurney) had to encounter and refute innumerable objections urged against the scheme—such as the expense, the public annoyance, the removal of horses from employment, the putting of coachmen, etc., out of bread, and all the hackneyed topics by which great improvements in machinery have been ever opposed—Mr. Gurney at length succeeded in getting a steam carriage established as a public conveyance between Gloucester and Cheltenham in February, 1831. It commenced running on the 21st of that month, and continued until the 22d of June—a period of four months—during which it performed the journey of nine miles between these places regularly four times a day. It carried in this time upward of 3,000 passengers, without a single accident, at a greater speed than that of horse coaches, and at half their fares. The value of the coke expended in this performance was about £50—giving an annual rate of about £150 for fuel. A horse coach to perform the same work, going at the rate of from 8 to 10 miles an hour, would have required 18 horses constantly to be maintained."

A long story is told of the persistent opposition which the new mode of transportation encountered. The roads were obstructed by stones, which made them impassable for the horse coaches when loaded, and Mr. Gurney strengthened his wheels so that he overcame this obstacle; but he could not ride over all the acts of Parliament hastily passed. "In some cases the tolls imposed amounted to 40s. ($10) at every gate; in others to 48s., and in some to 68s.; and, as if it were a national object to prevent the possibility of such engines being used, one of these acts applied to the road between Cheltenham and Gloucester."

Mr. Gurney petitioned against this injustice, and a committee of the House of Commons was appointed. The report of this committee is of great interest in view of the date of its appearance, if for no other reason. Mr. Gurney, in his narrative, says: "The committee, like all parties unacquainted with the real merits of the question, at first, I believe, considered the subject more visionary than real. How differently their minds were affected in the progress of inquiry may be judged of when it is stated that they soon applied for further powers, and deemed the matter worthy of close and deliberate investigation for three months. During that time some of the first statistical, scientific and engineering authorities gave voluntary evidence on the subject."

The *Edinburgh Review* continues:

"In the progress of their inquiry the committee extended their examination to the principal objections which had been urged to the application of steam on common roads. These were the danger of explosion, the annoyance to travelers, the fright occasioned to horses by the noise of machinery and the smoke and steam which escape at the chimney. The committee state that they are led to believe, by the result of their inquiries, that the substitution of inanimate for animal power on common roads is one of the most important improvements in internal communication ever introduced; that its practicability has been fully established; that tolls to an amount which would utterly prohibit the introduction of steam carriages have been imposed on some roads; that on others the trustees have adopted measures which place such carriages in an unfair position compared with ordinary coaches."

"Their report goes on to say:

" 'Without increase of cost we shall obtain a power which will insure a rapidity of internal communication far beyond the utmost speed of horses in draught.

" 'Nor are the advantages of steam power confined to the greater velocity attained, or to its greater cheapness than horse draught. In the latter, danger is increased, in as large a proportion as expense, by greater speed. In steam power, on the contrary, there is no danger of being run away with, and that of being overturned is greatly diminished. It is difficult to control four such horses as can draw a heavy carriage 10 miles per hour, in case they are frightened, or choose to run away; and for quick traveling they must be kept in that state of courage that they are always inclined for running away, particularly down hills and at sharp turns of the road. In steam, however, there is little corresponding danger, being perfectly controllable, and capable of exerting its power in reverse in going down hills.' "

The report of the committee of Parliament thus summarizes the status of the steam road vehicle in 1831:

"1. That carriages can be propelled by steam on common roads at an average rate of 10 miles per hour.

"2. That at this rate they have conveyed upward of 14 passengers.

"3. That their weight, including fuel, water and attendants may be under three tons.

"4. That they can ascend and descend considerable inclinations with facility and safety.

"5. That they are perfectly safe for passengers.

"6. That they are not (or need not be), if properly constructed, nuisances to the public.

"7. That they will become a speedier and cheaper mode of conveyance than carriages drawn by horses.

"8. That, as they admit of greater breadth of tire than other carriages, and as the roads are not acted on so injuriously as by the feet of horses in common draught, such carriages will cause less wear of roads than coaches drawn by horses."

We are not unaware of what is going on just now toward the development of the road vehicle, but as things have stood up to a time very close to the present, what have we been doing but "marking time" instead of making progress? It must surely be a marvelously perfect and satisfactory machine that we have to show in universal use before we can boast much of our 70 years of progress in this direction.

INDUSTRIAL NOTES

The Burt Manufacturing Company, Akron, Ohio, has just equipped the Elgin National Watch Company, of Elgin, Ill., with Cross oil filters.

The American Bridge Company, New York city, has received a contract from a Japanese railway which calls for 35 spans for 27 bridges for the Hokaido Railroad.

A. L. Ide & Sons, Springfield, Ill., have just issued a supplement to their Bulletin No. 41 illustrating and describing the "Ideal" automatic cut-off steam engines.

John A. Hamblin, 12 Beverly street, Providence, R. I., is making a new line of arc lamps which have been satisfactorily tested by several lighting experts in this country and abroad.

The Hardy Lamp Company, Pittsfield, Mass., is calling attention to its high-grade incandescent lamps and their seven years of successful development as witnessed by a long list of satisfied customers.

The Electric Gas Lighting Company, 195 Devonshire street, Boston, Mass., reports a large sale of its widely-known Sampson batteries, and that several large export orders have recently been received.

Bullock Manufacturing Company, Cincinnati, Ohio, has issued Bulletin No. 37, describing numerous of its manufactures and giving a list of a few of its patrons. The bulletin may be had free on request.

The Electric Appliance Company, Chicago, has been appointed general western agent for the new "socket extension tap" and is now engaged in sending out circulars and information regarding the device.

The Colonial Electrical Company, successors to the Orient Electrical Company, Ravenna, Ohio, manufacturers of incandescent lamps, is operating one of the largest incandescent lamp factories in the world.

The Norton Electrical Instrument Company, Manchester, Ct., manufacturers of voltmeters and ammeters, has recently increased its factory for a larger product of its instruments than has hitherto been possible.

Crouse-Hinds Electric Company, Syracuse, N. Y., reports a splendid outlook for electrical construction work as shown by inquiries for Fall deliveries of electrical switches, switchboards and panel boards, which it manufactures.

The Bridgeport Brass Company, Bridgeport, Ct., is meeting with great success with its phono-electric wire. It reports a large amount of business in that direction and that present orders will keep it busy for some time to come.

J. C. Fagan, Watertown, N. Y., manufactures a unique cutout and switch, which, placed on a ceiling, opens and shuts with a cord, for the control of either incandescent or arc lamps. It obviates the necessity of running wires down walls.

The Merchants' Association, of New York city, has issued a bulletin on freight classification which is of interest to electrical manufacturers. The circular may be obtained on application to the association, whose offices are in the New York Life Building, New York city.

William J. Murdock, 160 Congress street, Boston, Mass., has been compelled, by the growing demand for telephone receivers, to make plans for increasing his factory facilities, which, when completed, will cover nearly double the amount of room he now has for this manufacturing.

The Massachusetts Chemical Company, Summer street, Boston, Mass., maker of insulating compounds, announces that its volume of business during the last six months has nearly been doubled over the previous six months, and that its factory is taxed to its utmost in filling the orders now on the books.

J. M. Atkinson & Company, 1612 Marquette Building, is now filling its first order for one of the power houses of a Chicago street railway company for 80 circuit breakers. This circuit breaker has been designed by one of the engineers of this company and is said to possess several practical improvements.

The Western Telephone Construction Company, 153 to 159 South Jefferson street, Chicago, Ill., has prepared a leaflet illustrating and describing its Western Express, No. 1, series telephone and its cherry cabinet desk set. The company makes some strong claims for its apparatus which it is prepared to substantiate.

The Couch & Seeley Company, Boston, Mass., has been busy during the Summer perfecting a new line of telephone apparatus, which it intends to introduce on the market in the Fall. The apparatus will be of highest grade, involving modern features, something that will prove of interest to manufacturers in the telephone field.

The Driver-Harris Wire Company, 84-90 Mechanic street, Newark, N. J., has just issued a small volume in flexible binding containing tables of carrying capacities and other information of specific value to electricians relative to resistance wires. The booklet is devoted entirely to "Climax," "Advance" and German silver resistance wires.

The Columbia Incandescent Lamp Company, St. Louis, Mo., is making a special guarantee that Columbia lamps will be found absolutely uniform in initial readings for candle-power, voltage and efficiency, and particularly requests, in connection with Fall activity for central stations and isolated fields, that consideration be given to claims made for the superior quality of Columbia lamps.

The Safford Arc Lamp Manufacturing Company, Buffalo, N. Y., is introducing the improved Safford arc lamp adapted for all currents. A number of interesting features are claimed for these lamps, and electric light stations and those following lighting subjects would be interested in seeing a copy of this company's illustrated pamphlet.

The Hewitt-Lindstrom Motor Company, 75 North Clinton street, Chicago, Ill., is manufacturing a Stanhope electromobile which has created considerable comment among experts, as it has been seen on the boulevards of Chicago. All the vehicles built by this company are noiseless and particularly simple in construction.

The Dunmore Steel and Iron Company, Dunmore, Pa., has recently decided to equip its plant with electricity, and has placed an order with the Sprague Electric Company, New York city, for two split-pole generators and 50 motors. The generators are 62½ and 100 kilowatts and the motors range from 3 to 20 horse-power.

The New England Motor Company, Lowell, Mass., is issuing new bulletins describing its direct-current motors and generators of various types for various services. The apparatus of this company appears to be well designed and to be sufficient for the purposes for which it is built. The bulletins may be obtained free on application.

The Munder Electric Company, 32 Taylor street, Springfield, Mass., recently received some very satisfactory orders from abroad, which will keep its factory running to its fullest capacity. It reports that it has been compelled to add a night force, for the manufacture of incandescent lamps, to its regular complement of hands and employees.

The Crown Woven Wire Brush Company, Salem, Mass., announces that it has recently filled several large export orders for its well-known Crown commutator compound and woven wire brushes. The company states that foreign firms have tried this make of brush and commutator compound and feel thoroughly satisfied with the results obtained by its use.

The Central Telephone and Electric Company, of St. Louis, Mo., is making a unique combination desk telephone set having the generator and induction coil in the base. This company is also making a new desk telephone with generator, ringers, transmitter, receiver, induction coil, batteries, all in a compact oak box, furnished with a strap for carrying.

Mr. Percy Hodges, Boston, Mass., has recently established offices in the Exchange

Building for the carrying on of a general railway supply business. Mr. Hodges will act as New England representative for the Morris Electric Company, of New York. Mr. Hodges has been associated with the Boston office of the General Electric Company and is well known throughout the railway field in New England.

"You Needn't Worry" is the title of a folder just issued by the American Electric Telephone Company, 36-50 West Jackson Boulevard, Chicago, and in which its carbon lightning arrester and heat-coil "jump-out" is illustrated and described. The Burns individual station metallic circuit protectors, and a combined carbon lightning arrester fuse and high-potential current arrester, are also illustrated and described.

The prices of scholarship in the International Correspondence Schools, Scranton, Pa., will be increased on October 1. Before that date new students will have the benefit of the lower prices in force at the time of enrolling. Even at the new prices the scholarships are remarkably low and the terms of payment are liberal. Payment may be made in small instalments or a discount will be given to students paying in advance.

A table showing the mileage controlled by the principal railroad companies of this country on July, 1900, has been compiled by the *Railway Age*. The 10 largest systems are as follows: New York Central, 10,430; Pennsylvania, 10,392; Canadian Pacific, 10,018; Southern Pacific, 9,362; Chicago & Northwestern, 8,463; Chicago, Burlington & Quincy, 8,001; Southern Railway, 7,887; Atchison, Topeka & Sante Fe, 7,880; Chicago, Milwaukee & St. Paul, 6,437; Union Pacific, 5,584.

The Century Telephone Construction Company, Cleveland, Ohio, is reported to be having a most successful season of development along the lines of installing exchanges, hotel and interior equipments. The manufacturing department of this company is now equipped for constructing telephones, switchboards and accessories. The new Century transmitter is used on all of the instruments supplied by this company. The officers of the company are: Burt G. Hubbell, president and treasurer; C. B. Stowe, vice-president, and J. H. Fuller, secretary.

The Emerson Electric Manufacturing Company is now working upon a large export order for alternating-current ceiling fans to be shipped to the Argentine Republic about September 1. It consists of over 400 Emerson alternating-current ceiling fans, the shipment making a solid car load of large size. Another export order received by the Emerson Electric Manufacturing Company is for ceiling fans to be shipped to Budapest, Hungary, to be operated on the very unusual frequency of 15 cycles per second, or 1,800 alternations per minute. This frequency is much lower than anything used in the United States, the fans being used in railway cars which are operated by a three-phase current.

The Central Electric Company, Chicago, is in receipt of the following communication from one of its old customers:

"Please enter our order for 7,000 feet No. 14 rubber-covered wire, 400 feet No. 2 rubber-covered wire, 970 feet No. 4 rubber-covered wire, 310 feet No. 6 rubber-covered wire, 150 feet No. 8 rubber-covered wire, as per your favor of the 7th inst., providing the same is Okonite wire and of the same quality as this sample of insulation, which I have cut from some Okonite wire we put in here nine years ago."

The Central Electric Company reports that its sales of Okonite wire are constantly on the increase, and points to this order as proving its theory that the "best is the cheapest" in the long run.

Hugo Reisinger, 11 Broadway, New York, the sole importer of "Electra" highest-grade Nuernberg carbons, reports that business for the past season has been exceedingly satisfactory. Mr. Reisinger, who has just returned from Europe, states that in consequence of the enormously increasing demands for high-grade carbons, the European factory has been again compelled to enlarge its very extensive works, which are said to be by far the largest carbon works in the world, giving now employment to about 1,200 men. In its efforts to maintain the standard quality of its carbon products, the factory has been eminently successful and it is claimed that the "Electra" carbons remain unexcelled in quality and efficiency. With the larger facilities, Mr. Reisinger will be able to respond promptly to an expected increase in the demand for "Electra" carbons for the coming season.

The Eureka Electric Company, Chicago, reports a continuous and ever increasing demand for its high-grade telephone apparatus. This company states that it has always thoroughly tried and proven every piece of telephone apparatus it has offered to the independent telephone field. It asserts that none of its apparatus has ever been displaced and that all it has sold is in constant service. Recent contracts secured by the Eureka Electric Company are one for 1,000-subscribers capacity for the County Telephone and Telegraph Company, of Waterloo, Iowa, and equipment for the central office of the Niagara Falls, N. Y., plant, and a large transfer equipment for Fulton, Mo., similar in design and size to that supplied to McPherson, Kas. The company also has contracts on hand calling for an entire new equipment for the Tri-City Company, of Maquoketa, Iowa, as well as that of Fulton and Lyons. The Eureka Electric Company will be pleased to supply special information on any of its manufactures or anything in the telephone line, upon request.

CORPORATION NEWS

WILMINGTON, DEL.—The Newark & Granville Street Railway Company, of Newark, Ohio, has been incorporated with a capital of $300,000.

MONTICELLO, N. Y.—Monticello Telephone Company, of Monticello; capital, $2,000; directors: Martin La Tourette, E. H. Strong and D. S. Yeoman, Monticello.

WILMINGTON, DEL.—St. Mary's Terminal Company, of Baltimore, to erect buildings and construct railways and transportation facilities; capital, $500,000.

NEW YORK CITY—Challenge Incandescent Manufacturing Company, of New York; capital, $6,000; directors: Morris Kamber, Benjamin Fox and Jacob Hirshberger, New York city.

NEW YORK CITY—The Barker-Moyer Company, of New York city, has been chartered to do electrical contracting; capital, $10,000; directors: W. A. Barker, Newark, N. J.; C. O. Moyer and W. P. Dewey, Jr., New York city.

KINGSTON, N. Y.—Peckham Manufacturing Company, of Kingston, to manufacture motors, car trucks, and wheels; capital, $500,000; directors: James H. Everett, V. B. Van Wagener and Hewitt Boyce, Kingston.

NEW YORK CITY—Heniskayuna Power Company, of New York city, to develop hydraulic and electrical power; capital, $100,000; directors: Ernest C. Brown and L. J. Montgomery, New York city; W. A. Graves, Rexford Flats.

PEEKSKILL, N. Y.—An amended certificate of incorporation of the Peekskill Lighting Company, to form the Peekskill Lighting and Railroad Company, has been filed. The company will operate, in addition to its lighting and power plant, an electric railroad 25 miles long in Westchester County.

SIDNEY, N. Y.—A certificate of incorporation of the Susquehanna Valley Electric Company, was filed recently; capital stock, $200,000. Its objects are stated to be the manufacture of power and light; five directors are named, all residing on Long Island; but the corporation is to carry on business in Sidney and Franklin. This action revives talk of the Sidney-Franklin trolley road.

CRAIG, N. Y.—Articles of incorporation of the Niskayuna Power Company have been filed with the Secretary of State at Albany. The company is capitalized at $100,000, all subscribed. Its purpose is to dam the Mohawk River just below the state dam at Craig for power purposes. The incorporators, who are also the directors of the company, are E. C. Brown (builder of the Mechanicville dam), W. H. Fritchman, M. Montgomery and Mr. Landis, of New York, and W. A. Graves, of Rexford Flats.